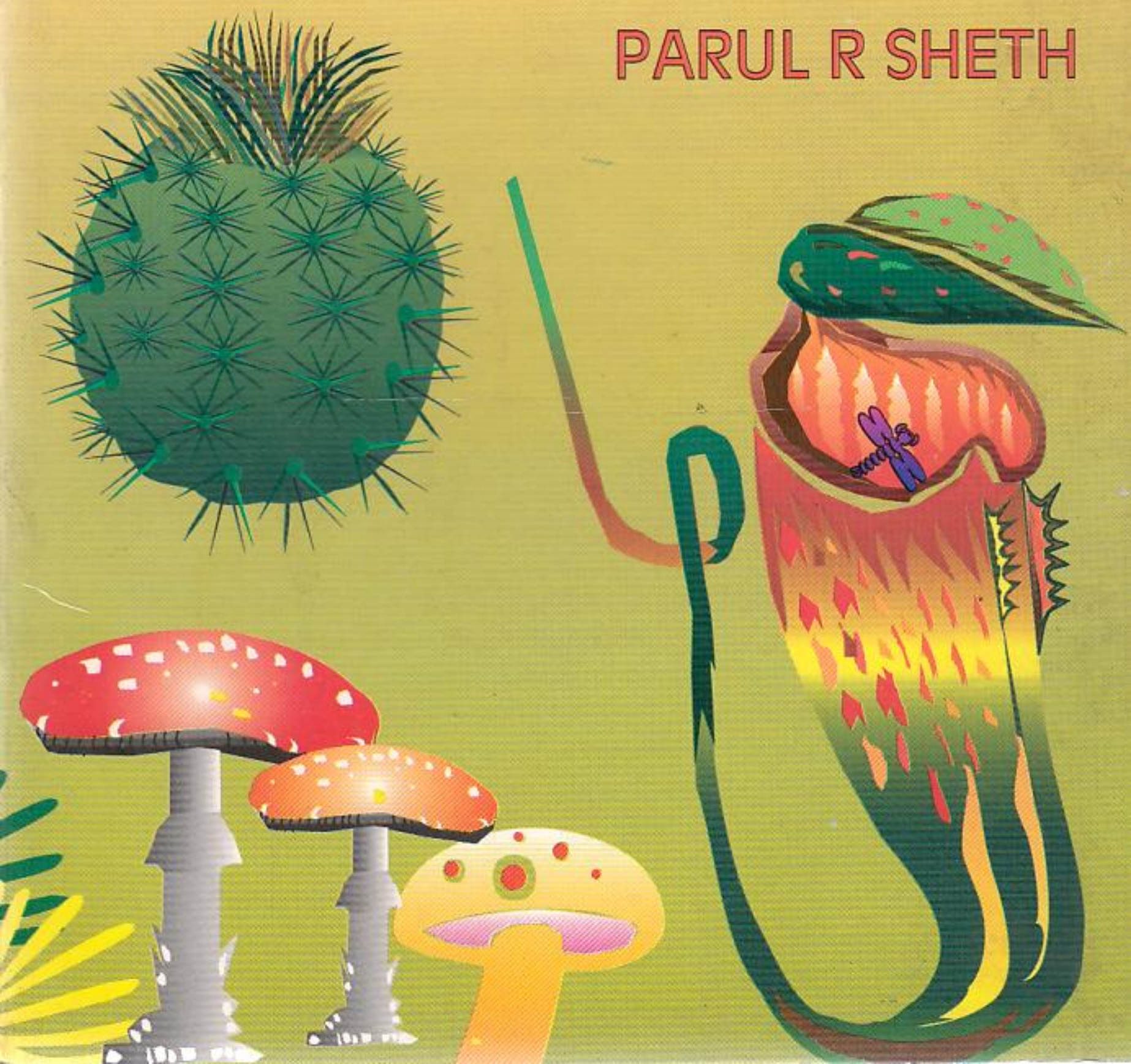


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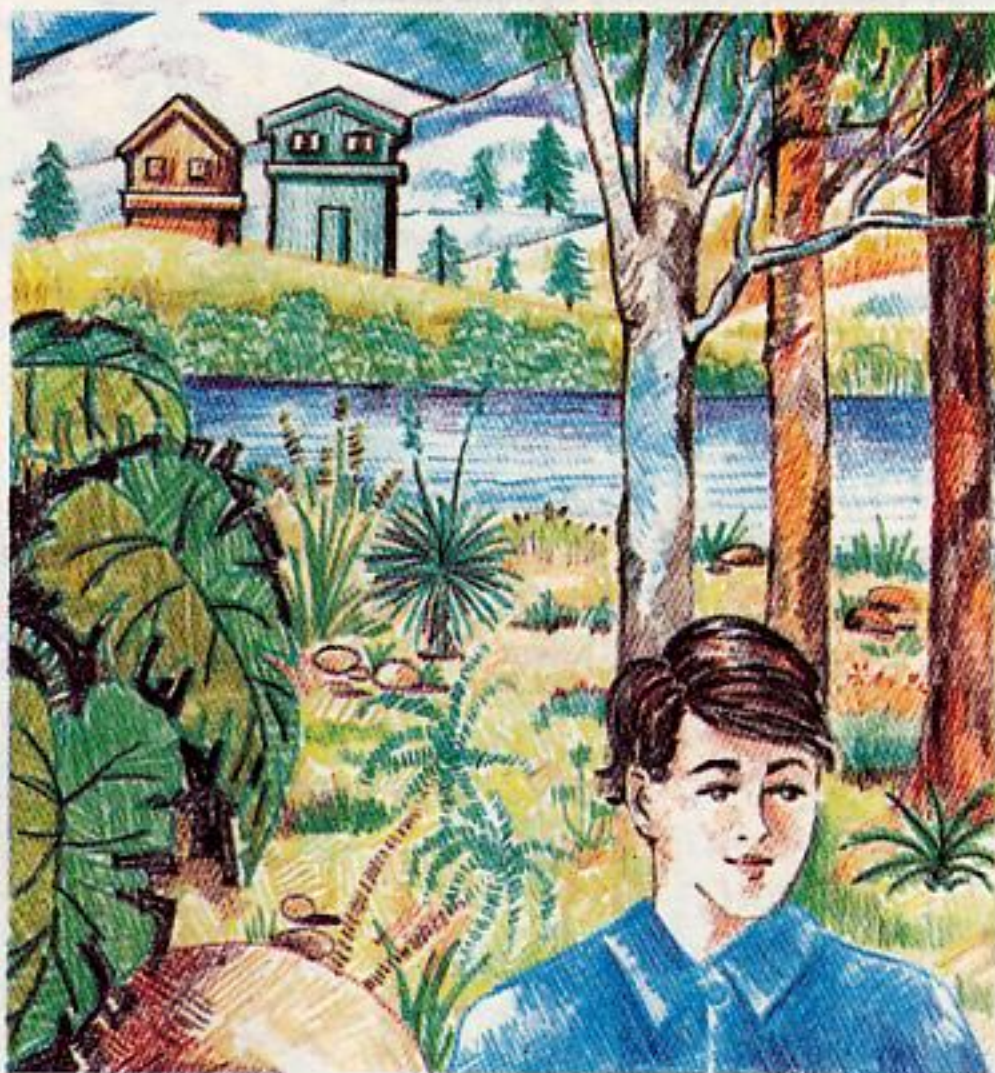
STRANGE PLANTS

PARUL R SHETH



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National Institute of Science Communication

Dr. K.S. Krishnan Marg

New Delhi - 110012

India

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Parul R. Sheth

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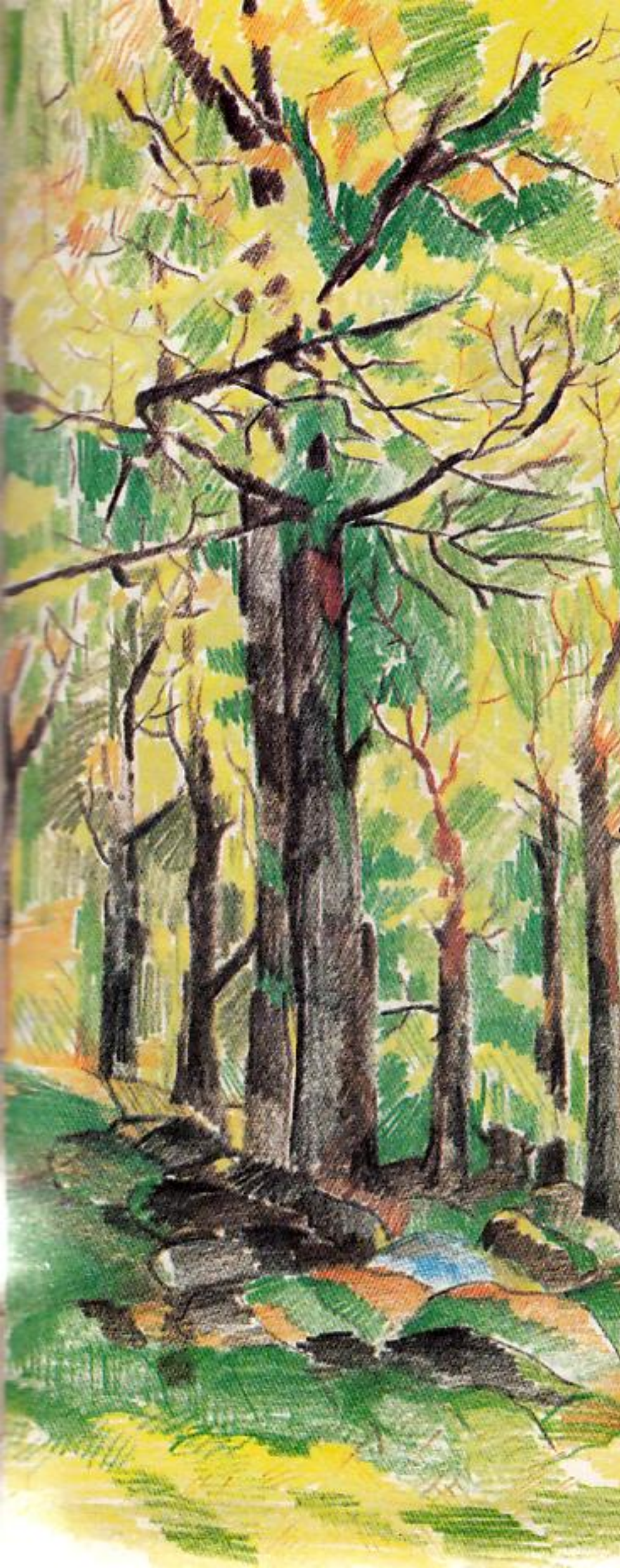
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PREFACE

Do you have fun climbing trees? Do you admire the colourful flowers? Do you enjoy eating fruits and vegetables? If you do, indeed, you are a plant lover. Botanists; scientists who study plants have discovered about 350,000 kinds of plants. And they find more new ones every year. Plants are extraordinary forms of life, in spite of being rooted in one place. They vary greatly in size and form, ranging from tall majestic trees to tiny, simple mosses. In fact, the largest living things in the world are trees! Plants supply people with food and many other useful products. They add beauty and pleasure to our lives. The book takes you on a grand trip to the kingdom of "strange plants", to look at the most unusual plants; plants that have giant leaves or those that kill other plants to make room or plants that even eat insects; 'Bon Voyage'. Hope you enjoy the adventurous expedition. Happy reading!



“Miten, please water the plants today, I’m tied up in work,” said his mother loudly from the kitchen.

Oh! no, not again!, thought Miten. The plants were in the balcony. Both Mr. and Mrs. Shah loved plants. They grew flowering plants in pots. Miten had turned out to be different, he was not fond of plants. He felt plants were too messy. They needed lots of mud and water. Watering and, caring for them were for Miten, a boring jobs.

He knew of course that plants were living, breathing entities. That they could fix their own food by means of chlorophyll, the green colouring matter with a little help from sunlight and nutrients in the soil. He had learnt some of these facts in school.

Sometimes his mother would tell him, “See Miten, look at these flowers.” Or she would say, “Here, take this *chutney*. The *dhania patta* is from my kitchen garden. Isn’t it tasty?”

Then his father would say, “Mr D’Mello sent us this ripe papaya. It’s from his garden. Have some, Miten.”

All that was Okay. But Miten did not like fussing over plants all day. Instead, he preferred to play cricket, read books or watch TV programmes in his free time. Miten studied in class seven and was a friendly child. He was good at studies too. Besides studies, he learnt many other things in school. For their hobby class they had plenty of choices. They could pick from dramatics, science projects, music, art, craft and kitchen gardening. Miten always wondered why some of his friends opted for gardening. He never did. Dramatics was his preference.

He made a face at the plants as he got up to water them. Then he left for school. For a change, this year Mumbai

had had a good monsoon. Better than the previous year at least. It had rained off and on, and the weather was cool even in the month of September. In school he heard some good news and could hardly wait to share it with his parents.

When Miten alighted from the school bus, he was so excited that he ran home from the bus stop. As soon as he entered the house, he screamed, "Mummy we are going camping from school. Will be there for three days. Hurrah! It is going to be fun!"

"Don't shout. Tell me where are you going?," replied his mother.

"We are going to Mahabaleshwar. And mummy, the teacher said it is compulsory to go," quipped Miten assertively.

"Take your daddy's permission when he comes back from office. Come now, have your milk," said Mrs Shah.

Miten was so excited, he could hardly drink his milk. In his excitement he spilled quite a bit of it, which of course did not make his mother happy at all. "If you don't drink your milk and eat the noodles. I shall not allow you to go," she threatened.

Sobered by the scolding, Miten picked up his plate and went to the balcony. From this vantage point he could see his father as soon as he got down from his office van. When Miten's daddy came back from the office, he listened patiently about the trip to Mahabaleshwar. He readily agreed, "Yes. Yes, you must go. You will learn many things."

The day came soon enough. Miten slung the haversack on his back. His parents also came along with him to the bus-stop. The school bus was waiting to take the children



to Mahabaleshwar. Mr and Mrs Shah were amongst the many parents who had escorted their children.

The students sat in their seats. There were forty girls and boys with three teachers accompanying them. Mrs Sheila D'Souza was in overall charge of the camp and of the boys in particular, while Miss Veena Agarwal had to take care of the girls. Mrs Swati Kāmat, the biology teacher of the senior section had also come along. At last the bus started. Children waved out cheerfully to their parents. The bus sped on its way to Mahabaleshwar!

Miten sat with his friends in the bus. Time flew quickly. Talking, singing songs and cracking jokes they were busy enjoying themselves. Swati sat right in front of Miten and his friends, Malav and Vignesh. She was busy admiring the beauty outside. She was a nature-lover. In school, she was the one who helped children with their kitchen garden projects. "Look children, you are really missing out on things. Look at those lovely trees and flowers. Such a panoramic view," exclaimed Swati.

"There she goes again." murmured Miten in Malav's ears. "She has nothing else to talk about except plants and trees. What's so great about these green ones? All are of the same kind." Malav giggled while Vignesh laughed aloud.

Swati turned her head and addressed them. "You are wrong Miten," she said. "You see, there are thousands of different plants in the world and they come in an amazing variety of shapes, colours and sizes. Plants are the oldest form of life on Earth. The first plants appeared 3000 million years ago. Now, tell me whether any of you know which were the first plants on Earth?"

Miten's curiosity was aroused. He had never thought about this before. "Which ones?," he asked.

"They were single-celled algae which lived in warm shallow water."

"What are alg algae"?, said Miten, twisting his tongue around the unfamiliar word with some difficulty.

"Algae are a collection of simple, very primitive plants. Their bodies may be made up of one cell or many. But they do not have any specialized structures," said Swati.

"You mean, no flowers or seeds?," queried Miten again.

"That's right. Algae do not have flowers or seeds," answered his teacher.

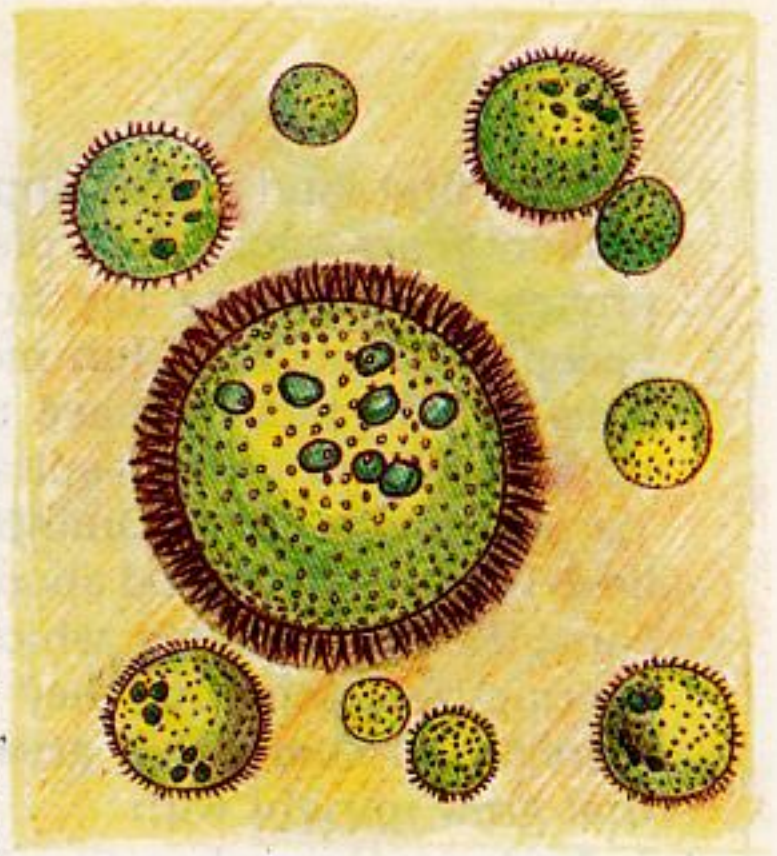
"But, how come the algae grew without seeds?," asked Vignesh. "Well most plants grow from seeds. However, not all plants produce seeds. Have you not seen the Bryophyllum plant? Tiny plantlets grow from its leaves, don't they?"

"Yes, yes. It is called *Patharkuchi* in Bengali," said shy Shantanu, suddenly joining in .

"Very good," nodded Swati. "Some lowly plants produce spores. These are usually single cells that have the special ability to grow into adult plants if they find hospitable environments.

Algae are very tiny. Some are made up of a single cell which splits into two. Algae need water to survive," explained Swati.

"So you mean plants first arose in water," said Vignesh. "Then how did they come on to land?"



Volvox is an algae that forms round colonies

"The first land plants appeared on the Earth over 430 million years ago. These plants were very simple. Lycophytes were among the first plants to grow on land. Lycophytes include Club mosses, quillworts and selaginellas. Club mosses have tiny needle-like or scale-like leaves and they grow in spiral patterns. They often form a 'carpet' on the floor. Quillworts and selaginellas are believed to have appeared about 300 million years ago. Then came the Rhinophytes, which were the first to have water conducting tissue but they had no leaves or roots. They merely had stems that grew along the ground or stems that grew upright with

Y-shaped branches. Slowly, plants with proper systems for conducting water appeared. These were equipped with roots, stems and leaves. Plants grew all over the world. They adapted themselves to the varied climates and surroundings. Scientists believe that there are about 350,000 species or varieties of plants. Whatever you learn in Botany is the study of plants. You know, plants can be strange. But whatever and wherever they are, remember they are the oldest citizens on Earth."

So engrossed had the children been that they had not even realized that they had neared their destination. Mrs D'Souza's voice broke into their thoughts.

"Come on children! Take your luggage. See that nothing is left behind. Get down from the bus. One by one. Do not rush, there is no hurry", said Mrs D'Souza loudly.

The children walked to the camp site accompanied by their teachers. They were to stay in tents. Camping was fun and adventure blended together. Children were taught survival skills such as 'natural' cooking, tying knots, rope climbing and they were also taken on a hike. They were taught to cook food in cans and earthenware pots on a fire they had to kindle themselves.



Leafy liverwort

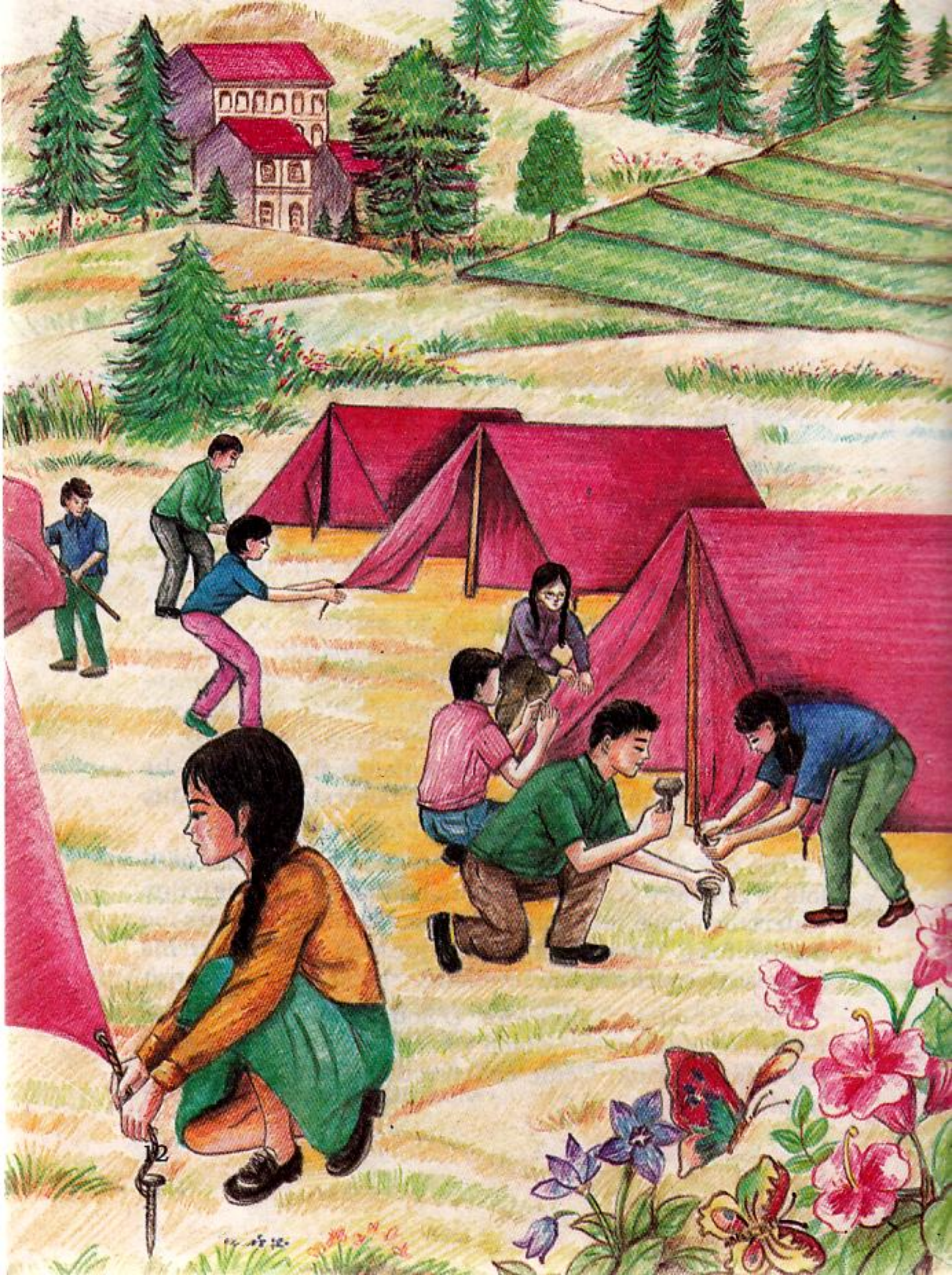


Liverwort

Miten was very happy to be with his friends. But he kept thinking about Swati's words. "Oldest Citizen!" This sounds interesting, he thought.

The place where they had camped was a plateau with lots of greenery around. The area had many hills with tiny waterfalls which made the place scenic. Small rivulets too flowed from these hills. Miten jumped up to join his friends. Everyone started walking.

"Now children," said Mrs. D'Souza, "We are heading towards that waterfall which you can see in the distance. It's a lovely walk. Come on everybody, one, two, three, hup!"



The walk was pleasant. There were lush green trees and bushes covered with colourful flowers. Butterflies and bees were hovering over the flowers. Swati walked ahead with her favourite students. Paarmi was a thin short girl with round golden-rimmed glasses. "Ma'am, this place is really beautiful, such lovely, colourful flowers!", exclaimed Paarmi. She always tried to be so friendly with the teacher thought Malav. He winked at Miten. Miten was in his own world, thinking about those olden times when the trees and plants would have been the only living things on this planet. He walked a little ahead of others to be with Swati.

"Ma'am please tell me more about those plants that appeared millions of years ago. Are they still living?"

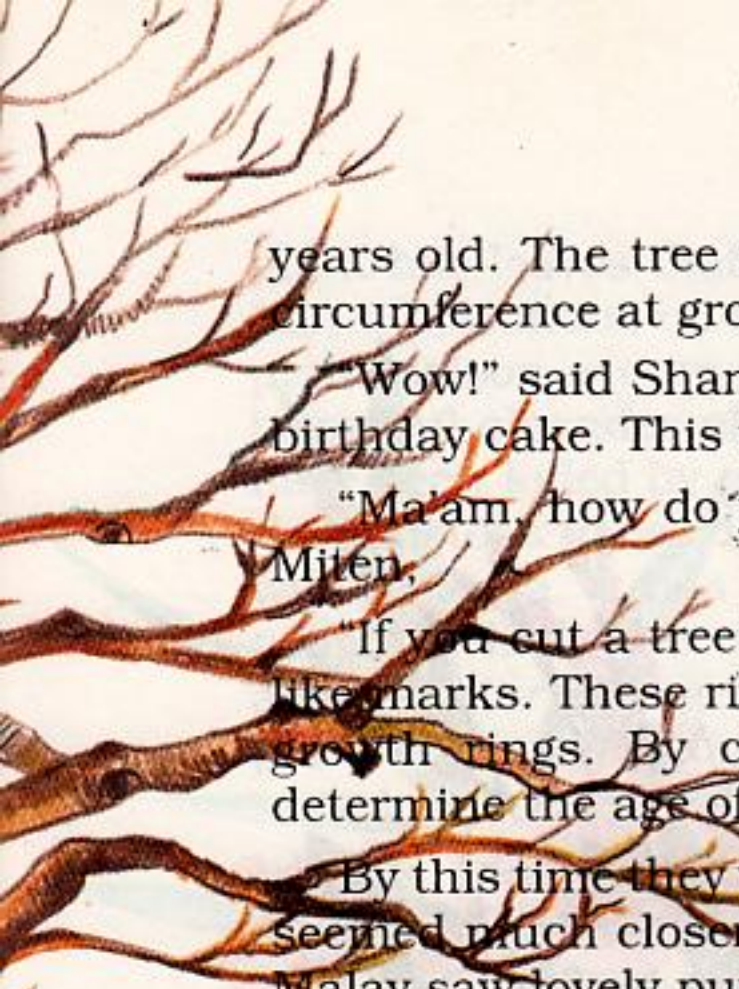
"You know Miten, *Ginkgo biloba*, the common name for which is Maidenhair tree is the only surviving species of a group of plants that lived about 160 millions years ago. This was the Jurassic era."

"You mean Jurassic, as in Jurassic Park?," Paarmi asked in awe. Swati smiled and nodded in agreement. "It was discovered in the temple gardens in China. Ginkgos have fan-shaped leaves that grow on the ends of shoots. The male and female plants are distinctly different. Today male Ginkgos are planted as ornamental trees. Cycads have also lived on Earth for millions of years. These first came into being about 240 to 63 million years ago. They look like dwarf palms and they bear cones. Some great Bristlecone pine trees, which are evergreen trees, can be more than 4000 years old. One of the oldest known living trees is a Bristlecone pine in the White mountains of Eastern California in North America. This tree has been named Methuselah after the Biblical character who lived to a ripe old age. It is more than 4,600 years old. There are reports of a common cedar tree in Japan which is 7200



The age of trees can be calculated
from these rings

This baobab must be quite old

A detailed illustration of several tree branches in shades of brown and orange, extending from the left side of the page into the text area.

years old. The tree is 32 metres high and 43 metres in circumference at ground level."

"Wow!" said Shantanu. "Imagine 4600 candles on the birthday cake. This tree is really O-L-D."

"Ma'am, how do you know the age of a tree?," asked Miten.

"If you cut a tree trunk horizontally, you will see ring like marks. These rings grow year by year and are called growth rings. By counting the growth rings you can determine the age of a tree," answered Swati.

By this time they were half way to the fall. The waterfall seemed much closer than before. As they were trekking, Malav saw lovely purple berries. He loved food and would eat anything and everything. He stopped and plucked the berries. "Aren't these beautiful?," he asked Miten.

But just as he was about to pop one in his mouth, Swati knocked it out of his hand, "No. do not eat these. These could be poisonous. Never eat any part of a plant unless you are sure, it's safe to do so. Some of the most beautiful plants have deadly leaves, berries, petals or branches."

"POISON!," exclaimed Malav, throwing away the berries he had so lovingly picked.

Swati smiled. City children knew so little about nature. But it was a joy to teach them. She pointed to a prickly plant and said, "These small thorns contain juice which can irritate your skin. You'll get stung even if you touch these lightly. Rhubarb, a vegetable that looks like lettuce has stems which are eaten but its leaves are poisonous. A person may become ill from eating the leaves because they contain oxalic acid salts which are poisonous. You must have heard about Poison Ivy. The plant has a poisonous oil which is extremely irritating to the skin. Another plant related to Poison Ivy, is the Poison oak. This



Poison ivy



Oleander



Datura

plant has leaves that consist of three leaflets which contain a poisonous oil that irritates the skin. The deadliest plant poison occurs in the seeds of the rosary pea. The beautiful oleander plant is also poisonous. Many people have been killed by eating poisonous mushrooms, which they mistook to be edible species. The Datura plant grows wild in India. It has a cluster of purplish flowers which people believe are dear to Lord Shiva. The seeds are another story altogether and have often found use as a poison for murder or suicide."

"Oh!", exclaimed the children.

"But why should we allow the poisonous plants to grow? We should uproot them," said Miten angrily.

"Of course not," said Swati, quite amused at Miten's reaction. "Poisonous plants do not mean harmful plants, dear. The plants need the poison to defend themselves against their enemies."

"Enemies? You mean plants have enemies?," an astonished Malav questioned.

"Yes. Insects, worms, bacteria and virus are all plant enemies. Plants also need the poisons and irritant fluids to ward off animals that would like to feed on them. No one likes bitter leaves or leaves that make the mouth itch. So animals avoid such plants," said Swati.

"The plants are clever," said Shantanu.

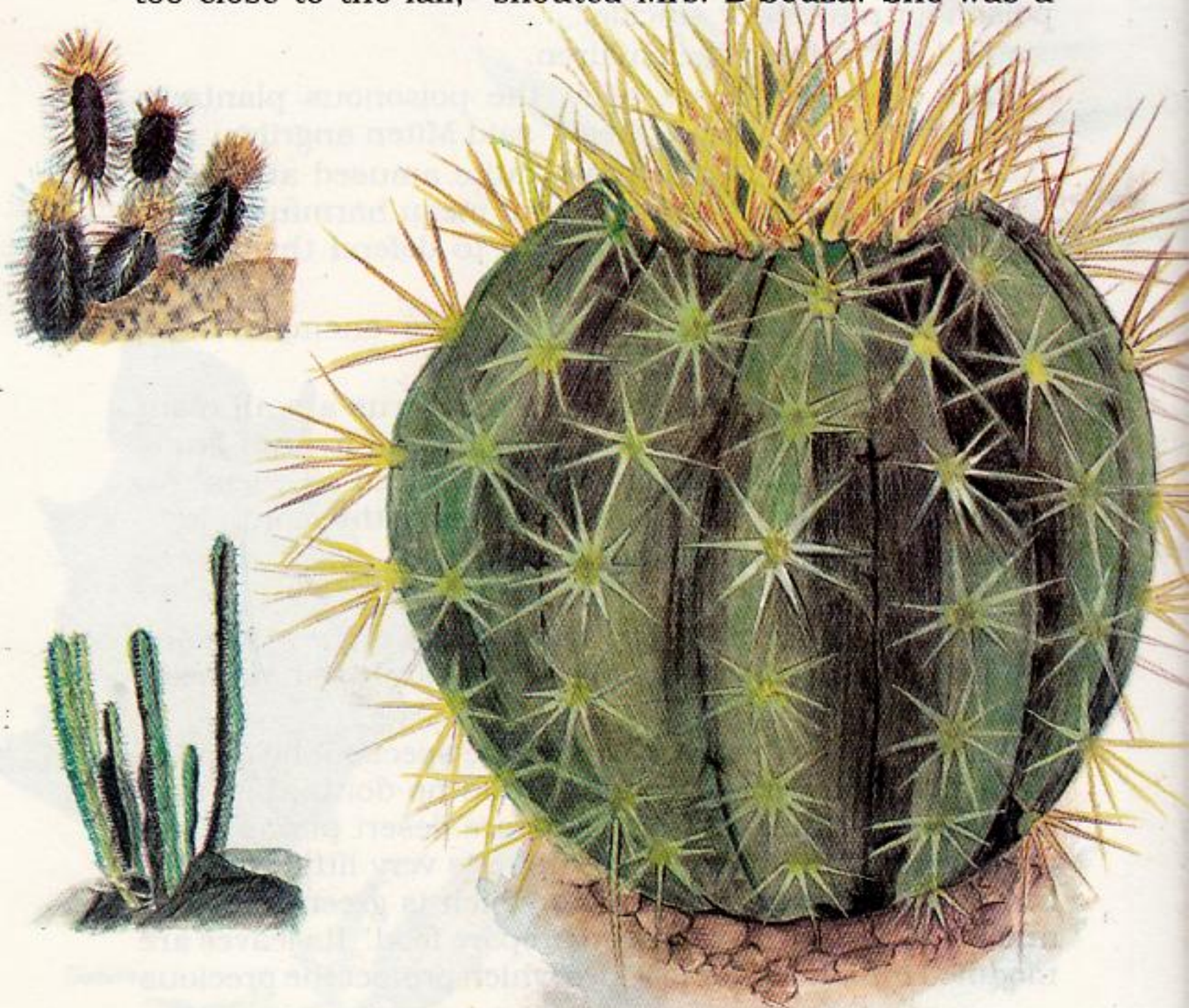
"And man is cleverer. You know, many of these poisons are used as insecticides while others are used as medicines," said Swati.

"The thorns you see on cactus are special," she continued. "Cacti have them for protection no doubt, but they serve another purpose too. Cacti are desert plants. They grow in dry conditions where there is very little water. A cactus stores water in its stem which is green in colour and which helps the cactus to prepare food. Its leaves are modified into thorns or prickles which protect the precious

store of water from animals and birds. The prickles also throw shadows and the cactus plant creates its own shade."

The children walked ahead briskly as they wanted to reach the waterfall as quickly as possible. At last they reached the fall.

"Take care everyone. The place is slippery, do not get too close to the fall," shouted Mrs. D'Souza. She was a



The cacti are wonderfully adapted to their environment

strict teacher who always demanded respect and got it. She liked discipline in children. However, no matter how strict she was, she was also a kind teacher. Children were scared of her, yet they willingly listened to what she said. But there were a few naughty ones who, inspite of being told not to go too close to the fall, ventured ahead. The water was knee-deep at the ground level. It fell from a great height creating a soapy foam and a loud noise. The flow of water became smooth after it touched the ground and then it flowed swiftly through the rocks and pebbles. "Ah,! Here we are," said Veena. "O.K. children, Spread the sheets and sit down. We will all have lunch first. Then, we can go exploring."

Lunch packets were handed out to students. They sat down in groups and opened their packets which contained '*Chappati* and *Bhaji*' with a banana as dessert. The packed lunch had been brought from Mumbai. Normally, every child would have made a fuss over the cold- lunch. But this was a camp and there was no reason for them to complain because they were with their friends.

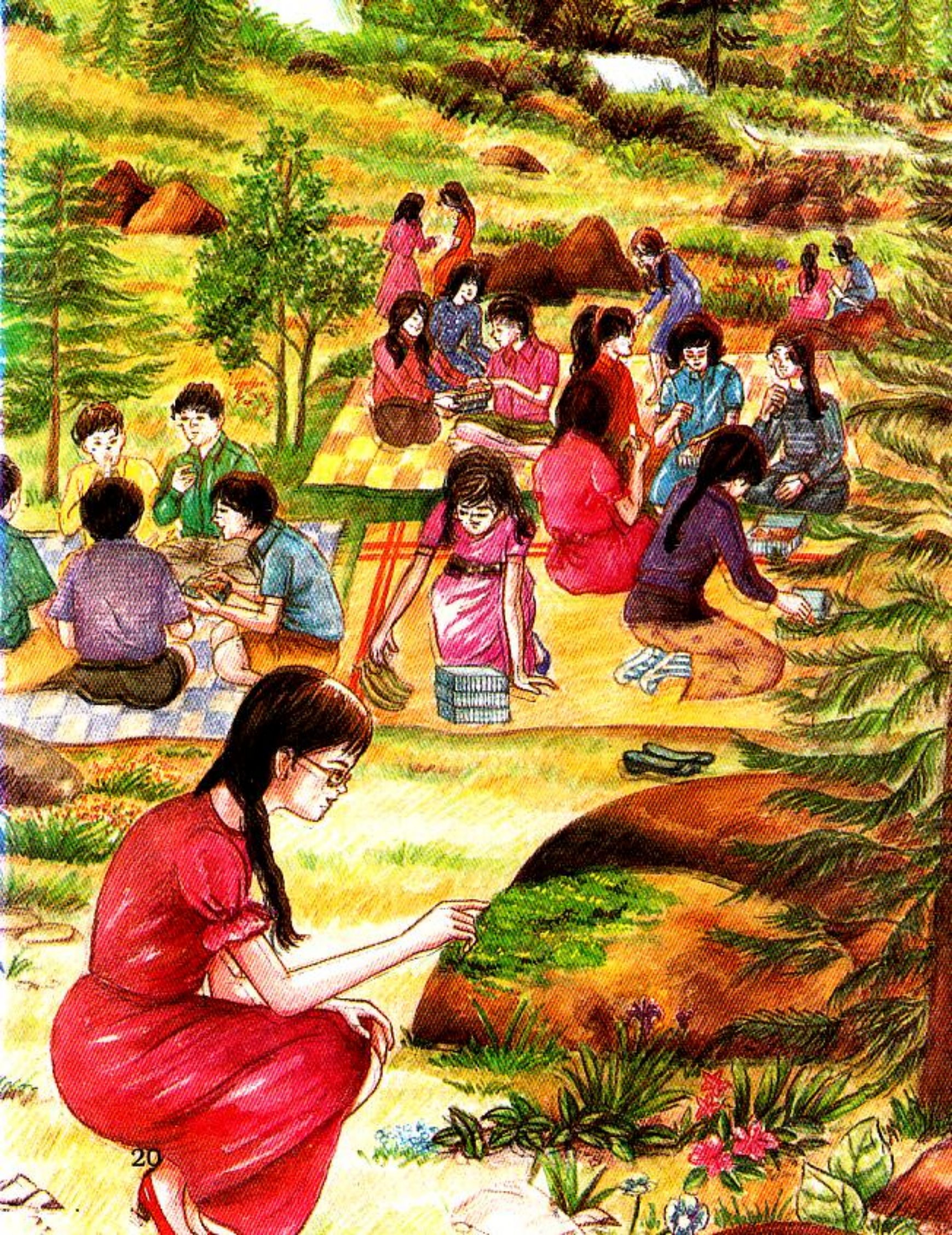
Swati chose a big rock as her seat. She was about to sit when Paarmi screamed. "Ma'am, do not sit there, it's dirty. Look at all that green stuff."

Swati turned around to check. She saw what the "green stuff" was and sighed with relief. "Oh! that's not dirt, it's moss. Mosses are plants."

"A plant"! exclaimed Paarmi.

"Yes, this green furry cushion growing on the rock can also grow on trees, ground or walls. It feels soft to touch. Do you want to test its softness?"

Paarmi came forward a little hesitantly. She was not quite sure about what Swati was saying but trusted her enough to try out what was suggested. She touched the "green stuff" gingerly, almost experimentally, with one



finger. It felt like a soft spring cushion. It was not squishy at all. Encouraged, Paarmi brought her palms down on it and pressed a little. "It feels so nice to touch. What is it?" she asked.



Polytrichum moss



Club moss

"These are mosses — thousands of tiny plants growing together. They grow best in damp places and even if they have dried up and turned brown, plenty of water will soon make them green again. You see, mosses are only a few centimetres tall. They can't grow any bigger because they have no way of carrying food and water from one part of the plant to the other. If you take a close look at these using a magnifying glass, you will see lots of thin stems covered with tiny green leaves. The tiny hairs hold the moss down to the ground. On the thin stalks above the leaves, there may be some tiny, pear shaped capsules which contain spores that are blown away to make new moss plants," said Swati, pausing to bite into her banana.

"When these pip-like capsules split, microscopic spores are released into the air. The spore lands and then sends out tiny threads. These threads behave like roots. They also send out branches from which the new plant shoots up. There are about 9000 species of mosses. The common species include the granite moss and peat moss. When mosses die, they decompose and release the nutrients trapped in their bodies. Other plants use these nutrients to grow."

"What about liverworts, Swati? These are also pretty unusual aren't they?" asked Ms Agarwal sitting down next to Swati.

"Yes," said Swati, "Liverworts are also leafy and moss-like plants. In fact, liverworts, hornworts and mosses are so similar that they are grouped together. Some of the liverworts are flat, like branched straps you know. They love damp places and flourish there. In damp and shady places such as these, grow ferns which also reproduce by spores. They grow taller than mosses because they have tiny tubes inside their stems and leaves. The tubes carry food and water from one part of the plant to another. The stems of ferns grow straight up out of the ground. Look, there is a fern plant where Miten is seated. Miten, please pick a fern leaf and bring it here," she called out. Miten had this sudden desire to please his teacher. He plucked a fern leaf and was about to pick some more when Swati sounded a warning. "No, Miten. One frond is quite enough. Don't pick too many. Don't hurt the plant."

Miten raced to where Swati was sitting. "Here it is Ma'am," he said handing over the delicate leaf.

"Thank you, Miten," smiled Swati. "Here, sit down and take a look. "See, each large leaf or frond is divided into leaflets. Can you see the spores on the underside of the leaf?", she asked. Paarmi nodded, "Yes Ma'am."



Spores can be seen on the undersurface of ferns.

"Spores are not seeds you know, but like seeds they can give rise to a new plantlet if they fall on moist soil."

After the children finished their lunch, they were given some free time. Some of them wandered around in groups. The girls, sat in a circle and played '*antakshari*'. Miten, Vignesh and Malav stayed glued to each other like the three musketeers of yore. They strolled around discussing their teachers, classmates and everything else under the sky.

"Children, do not go very far. Be back within an hour. Do not be late, otherwise we will go ahead and you shall be left behind. We'd better reach our tents before it gets dark," ordered Mrs. D'Souza.

Walking on green, damp grass was fun for Malav and Vignesh. However, Miten did not enjoy it much as his new sports shoes were soiled with the wet mud. On their way back, they came across many umbrella-shaped mushrooms. These looked cute and had colourful designs on them. Miten plucked a few and wrapped them in his handkerchief. He then went straight to Swati and showed her his prized collection. "Aren't these pretty? Can we cook and eat these?," he asked,

"Oh no! Definitely not! Don't even dream of eating these mushrooms. Didn't I tell you earlier that some mushrooms

can be very poisonous? They can be fatal if eaten. The poisonous variety of mushroom is called a toadstool."

Malav and Vignesh sat down next to Swati. They all wanted to know more about mushrooms.

"But Ma'am, these look so beautiful. How can they be poisonous?", asked Malav.

"Looks can be deceptive. There are about 3,300 species of mushrooms. Not all are umbrella-shaped. They can be ball-shaped. Or they can look like shelves growing on a dead tree. Mushrooms come in many colours. From red to grey. They can even be covered with spots." She took a breath. Then she smiled mysteriously, perhaps even a little naughtily. "Would you children like eating some fungus for dinner tonight?", she asked, her tone innocent.

"Uh!" said Miten instantly.



Mushrooms come in a wide variety of colours and shapes. Many are poisonous

"No never. How can one eat fungus? We'll fall sick", added Malay.

"That's where you are wrong! Mushrooms are fungi. Don't you eat mushrooms?"

"You mean... you mean mushrooms are fungi?", faltered Miten. "But I always thought fungus was something dirty. What then is a fungus?", he asked, his eyes wide with wonder.

"A fungus is a sort of plant, dear," answered Swati. "Only there is one small, but significant difference. Now, tell me have you ever seen green mushrooms?"

"No," all three children answered in chorus.

"You haven't, because there aren't any. Fungi do not have chlorophyll which gives plants their green colour," said Swati.

"But, without chlorophyll how can they prepare their food?," asked Miten.

"Good question. Mushrooms as well as other fungi, survive by absorbing food material from living or decaying materials in their surroundings. The umbrella shaped mushrooms which you see are just the fruit-making part of the fungus that appears only at certain times of the year, usually in autumn. This fruiting body lives only a few days. And during that time, it produces tiny spores or cells from which new mushrooms grow", explained Swati.

"Ma'am how do mushrooms absorb food"?, interrupted Miten.

Swati continued, "Mushrooms have thread-like structures called mycellium which absorb food material. Mycelia absorb water quickly and grow. This is precisely why mushrooms seem to pop up overnight after a heavy rain. The mushrooms we see are the fruiting body of the fungi."

Suddenly Miten remembered what he had read in fairy tales. "Is it true that fairies sit on mushrooms?"

Swati smiled. "Earlier, mushrooms were thought to be seats on which the tired fairies sat. You see, sometimes you'll find mushrooms growing in a circle on a field. These are called fairy rings. People used to believe that the rings were trails left by fairies dancing at night. In the grasslands in Colorado, there are fairy rings that measure about 60 metres in diameter. Scientists believe that these rings are over 200 years old."

"In Bengali, my mother tongue, the term for mushroom literally means the frog's-umbrella", said Shantanu with a grin.

Every one joined in the laughter that followed.

Soon it was time to return to their tents. The children started walking towards the camp. Their teachers brought up the rear. The sun was setting and the group quickened its pace. They reached in time for camp-cooking. Veena Ma'am announced that she needed some tea. But Mrs D'Souza said, that she did not have extra saucepans. Swati who was sitting nearby popped into her tent and came out with an elongated object. "Here Veena, heat the water in this", she said handing it over.

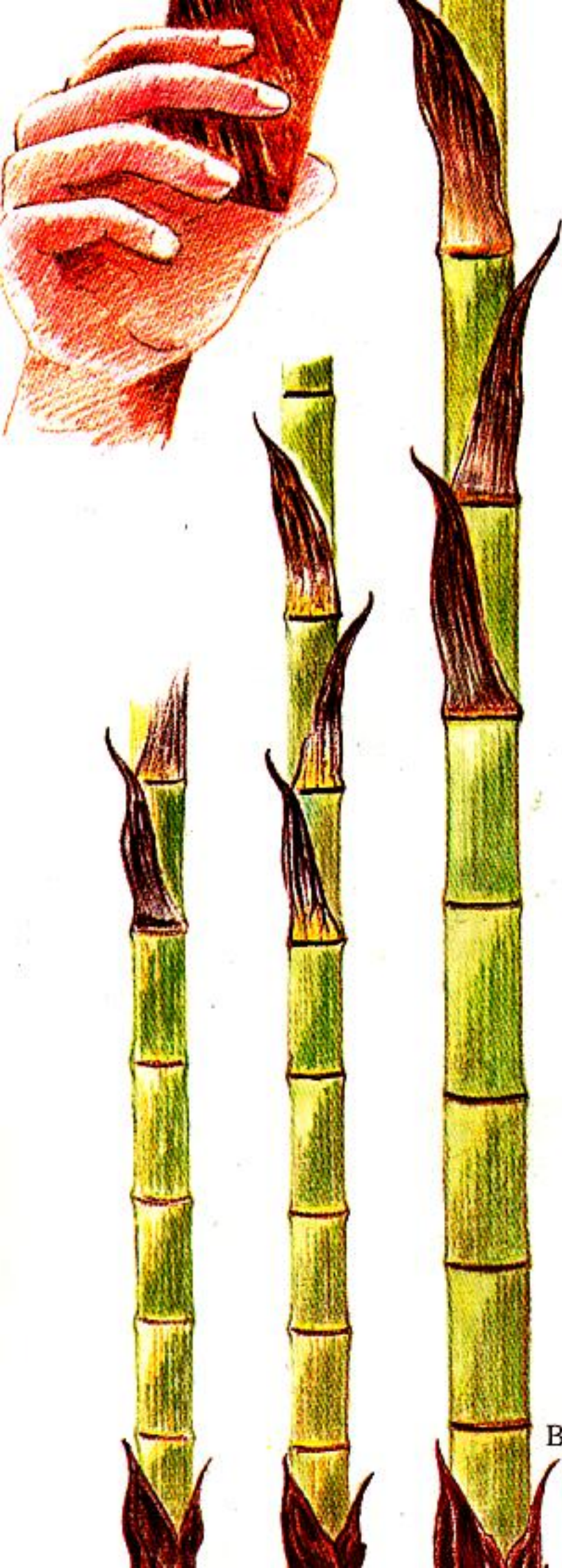
"What is it, Swati?", asked Veena.

"It is a bamboo stem. Part of one, actually. The base is the node where the leaves grew. The hollow stem can be filled with water and the tea can also be brewed in it."

"Nature is wonderful", enthused Veena.

"Just give me a cup of tea too", replied Swati.

Apart from cooking in the usual pots and pans, the children were taught to cook food wrapped in aluminium



foil. The food wrapped in foil was turned several times over the coal fire till it was well-cooked. It was tasty and the children loved it. Dinner over, the children sat in a circle. From far they looked as if they had formed a fairy-ring around the camp-fire.

The bright flames lifted everyone's spirits. The sky was covered with dark clouds and even though a cold wind was blowing, the fire kept everyone warm. The stars were not visible and it looked like it was going to rain. There was dancing and singing. The sight of the camp-fire and the crackling of burning wood made the atmosphere lively. Everyone was tired after the hectic day they had spent. After a while they seemed eager to go to bed on the mattresses spread on plastic sheets, a protection, in case it rained. And so it did. But luckily it was just a drizzle. The night went by and the children

Bamboo cups are a novel and unusual idea.

Don't you want one?

slept cosily under the blankets they had all carried from home.

Miten got up very early in the morning. He woke up Vignesh and Malav, "Let's go take a walk outside whilst everybody is asleep," whispered Miten. The three children sneaked out of their tent. It was still dark outside. The morning star was shining overhead. Away from the city's pollution, it seemed so much brighter. The air was crisp and clean. The children took deep breaths.

Vignesh did some stretching exercises. "Everything looks so clean and nice", he whispered. "Let's go exploring". The path was muddy and slippery because of the rain



last night. They had a torch and its light guided them. But they didn't really need the torch. It soon grew light enough for them to see.

Dawn was breaking. The sky was a beautiful pearly pink shot with liquid gold. The trees plants swayed in the morning breeze. Freshly washed from last night's showers, it seemed to Miten that they were smiling and wishing him 'Good Morning'. How come he had not realized how pretty plants could be! That fern up ahead had such lovely, delicate leaves. And that yellow flower..... How beautiful it was. Without realizing it Miten slowed to admire the beauty of nature.

The grassy pathway was strewn with small plants, and wild flowers. Tall trees towered above. This is real adventure, thought Miten. He was amazed to see the many tiny, crawly insects already busy with the day's business. On a damp part under a tree were tiny ball-like structures. Miten picked a few of these. He also noticed a coloured patch of crusty matter on the tree. He wondered what it was. He made a mental note of it. He had to ask Swati. May be she would like to see it. So he scraped some of it with a sharp rock and tied his collections in his handkerchief. Suddenly, he heard a scream.

It sounded like Vignesh's voice. He ran towards the direction of the sound.

Malav was bending over Vignesh who was lying on the ground. "Miten, he just slipped and fell against a rock. What do we do now? I am so scared. What will Mrs. D'Souza say?", sobbed Malav.

Vignesh was in pain and shock. His head was bleeding. Miten soothed him and gave him support. Malav and he helped Vignesh to sit up. It was morning now and the sun was shining bright in the sky.

The children looked around desperately. Suddenly Miten shouted, "Look Malav, there is someone there. You stay here with Vignesh. I'll run and get help".

Patting Vignesh he said, "You'll be O.K. Don't worry".

Miten ran as he had never run before. He arrived panting before a group of young village kids who had brought their cattle out for grazing. Gasping for breath, he poured out his story.

The village kids were not much worried. "Is he conscious?", they asked.

"Yes, he is, replied Miten. "But he is bleeding."

"Let's go and see", said the leader of the village kids. He was called Chotu and was around Miten's age but very self-assured. He plucked a few blades of *darbha* grass and washed them in the stream flowing near by. "We'll need these", he said. The children sped on their way. When they reached, they saw that Malav was trying in vain to stop the blood from flowing. His hanky was soaked in blood.

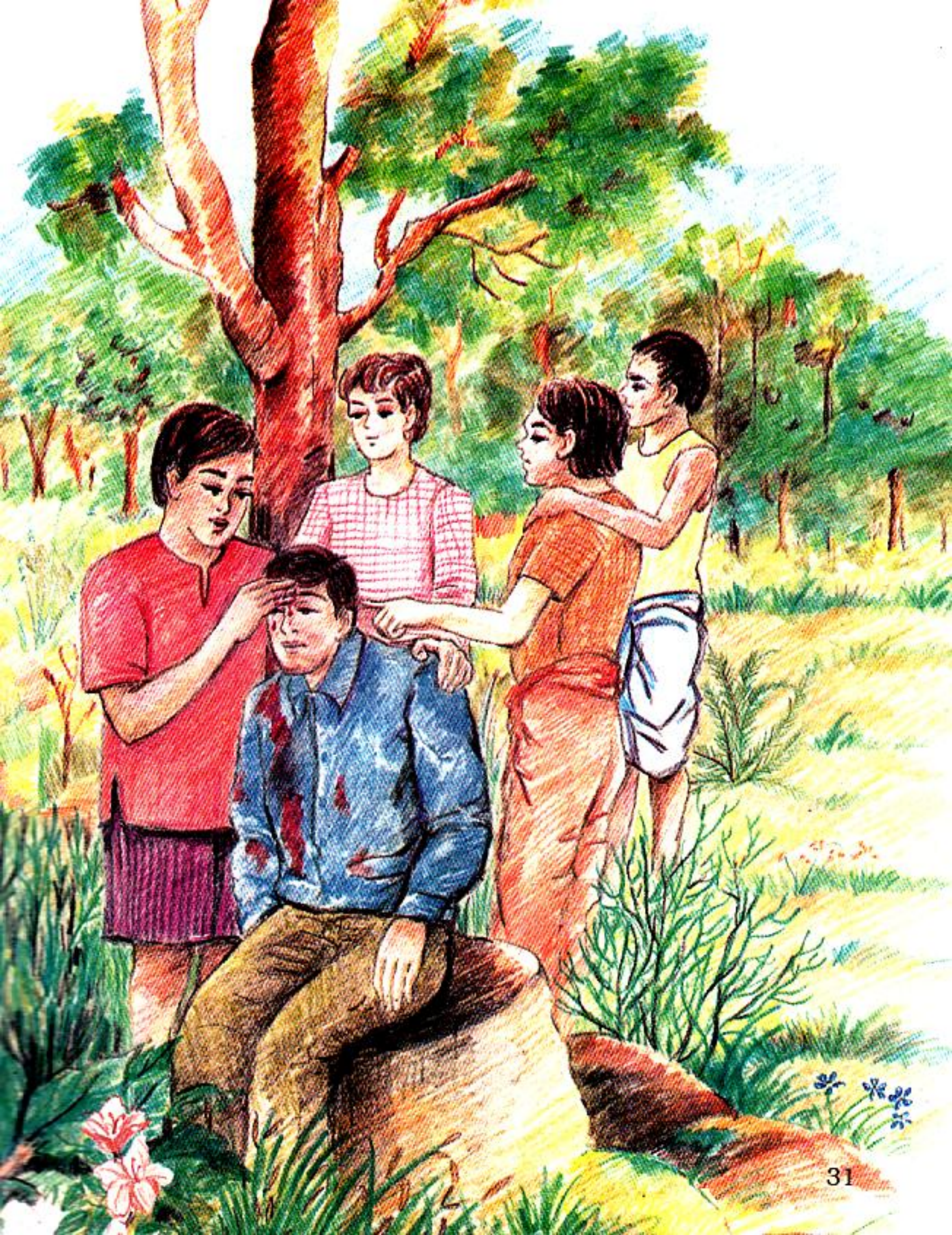
"Move", said Chotu elbowing Malav out of his way. In his hands were the crushed *darbha* grass. He applied the crushed grass to the wound and held it firmly in place.

"What are you doing?", asked Malav, a trifle irritated at being pushed.

"Stopping the bleeding, can't you see?", said Chotu not taking his eyes off Vignesh.

"You mean those leaves can stop the bleeding", said an incredulous Miten.

"Not leaves. Grass. *Darbha* grass. It is very good for stopping bleeding, provided it is clean. I washed it. We use it all the time. Don't you know anything? What do you use at home? There! See, the bleeding has stopped", said a triumphant Chotu. And so it had.



Miten and Malav thanked Chotu profusely. The children then brought Vignesh back to the camp. Chotu came a part of the way with them talking nonstop, showing off his knowledge. It was not everyday that he could impress city kids.

"We know plants that can cure, headaches, blood-pressure, diabetes, infertility, sleeplessness, worms, pains..... you name it. Even Cancer".

I bet he's making all this up, thought Miten. How can plants heal so much? But before he could raise objections to Chotu's claims, his new friend said goodbye hurriedly and left to take care of his cows.

Miten made Vignesh lie down in the tent. All the children gathered around Vignesh to see what had happened. Miten ran to call the teachers. They came rushing with the first-aid box. Mrs D'Souza cleaned the wound while the other teachers held Vignesh's hand and comforted him. Luckily the wound was not deep. Mrs D'Souza applied an antiseptic and bandaged it firmly. She also gave Vignesh a pain-killer and made him lie down.

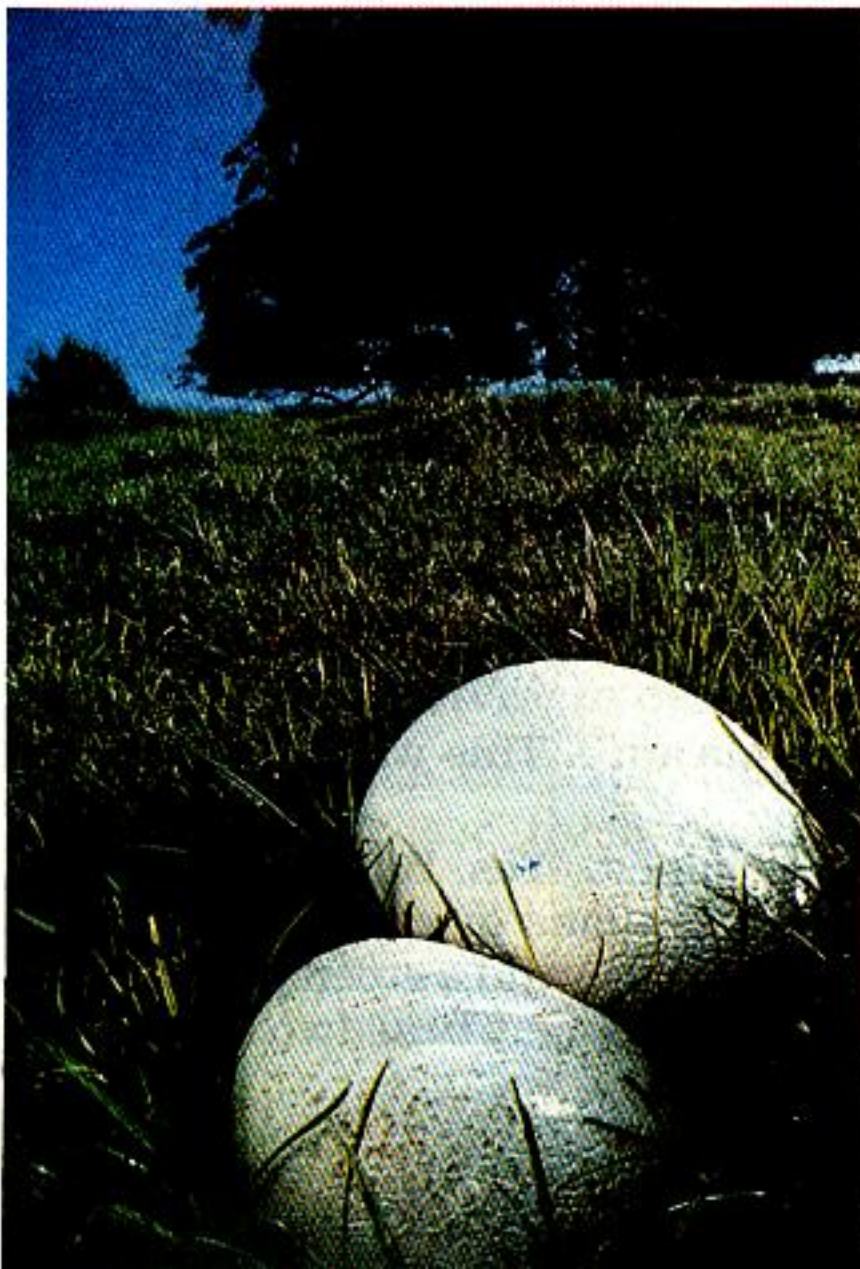
Miten and Malav stood in a corner, fearing the next moment. And sure enough, Mrs D'Souza told them in a stern voice, "See what happens when you are disobedient? What if Vignesh had a fatal injury? Do you children ever imagine the consequences?" She then addressed the other boys and girls who had assembled there. "Never go out alone like this. This ought to be a good lesson for you all".

"Sorry, Ma'am", Miten was the first one to apologise, followed by Malav.

"Now, our next camping lesson will be on First-Aid. Ms. Aggarwal will show you all the first-aid manoeuvres", said Mrs D'Souza.

All through the session on First-Aid, Miten's mind was occupied with what Chotu had said. 'Medicines from plants'. 'Healing that came from herbs'. How well the *darbha* grass had worked. My God! There must be some truth in what Chotu had claimed. Swati Ma'am would no doubt have more information. He would have to have a long chat with her.

Evening came and there was some free time for all. Vignesh rested in the tent. The teachers sat in a group and chatted. The children were busy playing or talking. Malav and Miten joined the group of students planning to play cricket. One of the students had a flat wooden bat and another had carried a ball with him from home. Despite the excitement of the game, the children were more careful now, after Vignesh's incident.



Miten was fielding. Nothing exciting was happening. He looked up. How beautiful were the tall trees. He remembered the plants which he had collected in his handkerchief and left on his mattress in the tent. He had completely forgotten about them. He excused himself from the game, went to the tent and brought out his booty. He went straight to his 'new' favourite teacher.

"Ma'am please could you spare a moment? This is what I found when I had

Huge Puffballs. Just imagine
these bursting

gone for a stroll in the morning", he said.

Swati looked at his collection with interest. "Very good," she said and went on to explain. She picked up a white, squishy thing. "This is a fungus, a mushroom which has a round head. It looks like a ball and so is known as a Puffball. Its spores are stored inside the bag-like structure. The interesting fact about this is that when a rain-drop falls on a ripe puffball, a small cloud of spores is puffed out. It has a distant cousin in the giant puffball of Central America. These are said to choke nearby observers when all the many billions of spores explode together. Of course, I've never seen that happen", said Swati with a smile.

"Oh, so puffball is not a proper name. It is a name of a group, isn't it, Ma'am?", asked Shantanu who had been listening quietly.

"Yes, I cannot tell you the proper and exact scientific name of this particular fungus without studying it in greater detail. But puffball is a good enough name for now. And ah! What do we have here?", Swati sounded excited. She had been poking around, picking up and discarding the bits of dirt and twigs in Miten's collection. Her eyes had spotted some crumbly looking things. Looking at the scraped crust, she could not control her excitement. "These are lichens. Where did you find them?"

"Lichens, Ma'am? What are lichens?", asked Miten. He pronounced it as Leechens.

"Its pronounced 'Li Kens', Miten", corrected Swati. "Lichens are plants too".

"They don't look like plants, Ma'am". This was Shantanu's quiet comment.

Swati agreed readily. She explained, "Yes. But look at these closely. They have no leaves, stems or even roots. Lichens are actually two plants, a fungus and a green alga. which have decided to live with each other. These two live



Lichens represent Algae-Fungi friendships

together like two 'best friends' and help each other. You remember don't you, that the fungi cannot make their own food. How exactly the partnership works to the advantage of both is not very clear. The fungus gives out nitrogenous and phosphatic compounds to be taken up and used by the algae. The algae also brings oxygen to fungal tissue while the fungus brings carbon dioxide to the alga. The alga seems to depend a little less on the fungus than the reciprocal relationship. But together they can colonise the harshest land and find 'toe holds' in unlikely places. The two grow very slowly and can live for long. Lichens are tough. They can grow anywhere, on rocks walls, on skulls of dead animals, on tree trunks and even on the surface of leaves. They usually grow in moist conditions but they can also survive in deserts."

"But Ma'am, if they can grow just about anywhere, why don't we see them around our houses?", interrupted Miten.

"Quite right, Miten. We don't see lichens in cities. You see, lichens are fussy about the atmosphere they grow in.

They are hardy no doubt, but in a way, they are very delicate. Lichens do not like poisoned air or water. They cannot stand pollution. You will never find lichens near factories or urban areas."

"Ma'am, lichens again, does not seem to be a proper name. It just means the association between an alga and a fungus. So there may be many partnerships depending on which alga forms a friendship and which fungus reciprocates. So, Ma'am do all lichens look the same?" This was Miten.

He sounded so much like Shantanu that Swati was a little amused. She also felt a tiny thrill of joy. Miten was close to understanding the wonders of Botany.

She nodded. "Scientists have found that there are several thousand fungal species that can form lichens. But there are comparatively fewer algae that can form lichens. The fungi share the algal species that are willing to form lichens. The two components form a plant which is in totality, neither a fungus nor an alga. It is somewhere in-between. Lichens do not look alike. Green-grey crusty lichens lie flat. Leafy lichens are also flat. But they also appear a little rounded and come in different colours. Shrubby lichens look like tiny bushes with long hairy stems. Lichens help other living beings to survive. Few plants grow during the Arctic winter. So the food situation becomes grim. The reindeers survive on lichens. The physiological activity of lichens cause mild acidity that eats into rocks and break them up. This crumbling turns the rock into soil, where other plants can grow. Lichens also provide shelter for insects", explained Swati. She took a deep breath.

Mrs Agarwal was feeling restless. "Let's go for walk upto that pond there", she said. Swati agreed readily. Mrs

D'Souza opted to stay back to keep an eye on the students. Miten and Malav promptly asked if they too could come along. Two other girls, Riddhima and Paarmi also joined the group. All proceeded towards the pond. The pond was not very big. Pretty pink lotuses floated on the waters.

"Such pretty flowers!", exclaimed Paarmi. "But see, most of them are folding up. It looks as if the flowers are getting ready to go to sleep".

The boys pulled faces as if ridiculing the idea. But Swati spoke up. "Yes. That is exactly what the flowers are doing. Folding up also prevents morning dew from washing away the precious pollen. The fact, that lotus flowers go to sleep was observed by the 18th century biologist Carl von Linnaeus. The lotus flower in his greenhouse had flowered and Linnaeus wanted his gardener to see it. However, the flower was nowhere to be seen that evening. Linnaeus assumed that insects had eaten the flower, but the next morning the beautiful flower was in full bloom." The children laughed.

"I wonder what their bed time is?", mused Miten. "Mine is pretty early. My mother is quite strict."

"Oh! Mother Nature is also quite strict, don't worry", said Swati. She links bed-time with sunlight hours."

"Lotus flowers are known as water lilies, isn't that right, Swati?", asked Ms Aggarwal.

"Yes, very true. These lotus flowers here are pink in colour. You must have seen white ones but there can be purple lotuses too. Do you see the big leaves floating on the water surface? It is quite surprising that though the lotus plant has a stem or stalk 1.2 to 2.4 metres long yet it rises only a little above the water surface. Its root grows in mud at the bottom of lakes and ponds. Riddhima was a clever girl. "Ma'am, since we are near water, will you



please tell us more about other plants which can survive in water", she requested.

"Good idea, Riddhima", beamed Mrs Agarwal.

"Let's see which aquatic plants we can spot from here



Water Hyacinth is a weed with exquisite flowers

and then I'll tell you about them", said Swati. "See those lovely mauve flowers?. Those belong to the water hyacinth. Water hyacinth and duckweed plants have many empty spaces throughout their bodies. These spaces are filled

with air which makes the plant float on water. The water hyacinth was imported to India because of its beautiful flowers. Unfortunately it has grown unchecked and now chokes many water-bodies. So we call it a weed."

Miten was listening to Swati with great interest. As he heard her speak, he remembered what she had said earlier, "Ma'am, you said that algae were the first plants on earth. They lived in water. Will there be algae in this pond also?"

Swati was pleasantly surprised. She beamed a bright smile and said, "Class, I am sure that this pond is home to many algae, why don't we take some pond water back to the tent and check it out?"

The children cheered the idea.

Swati opened the voluminous bag that she always carried and took out a couple of small glass vials. "There is a preservative in these vials," she said. "It will help preserve the algae and other organisms till we get a chance to observe them."

She approached the edge of the pond and carefully collected some water in the vials. She closed the cap tightly and returned to the children.

"Are algae of any use to us, Ma'am?", asked Shantanu.

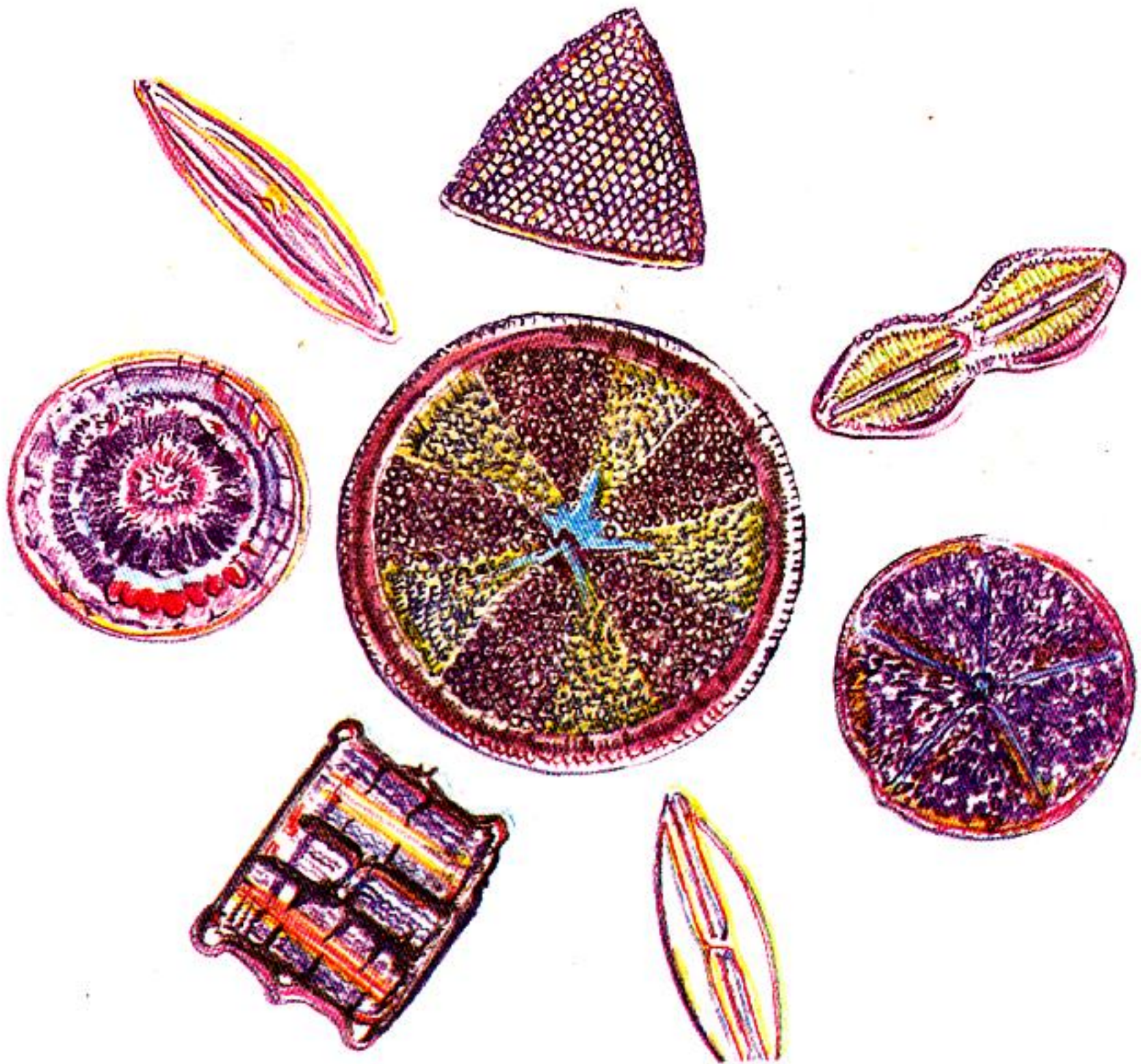
"Indeed yes. You use them, first thing in the morning," replied Swati.

"How's that?", asked Miten.

"Well, diatoms are a kind of algae. They are special in that they have cell-walls stiffened by mineral such as silicon. Diatoms look like a box with two almost equal halves, one overlapping the other."

“What have diatoms to do with us?”, asked Malav a trifle impatiently.

“Patience dear”, said Swati.



Diatoms can have many shapes

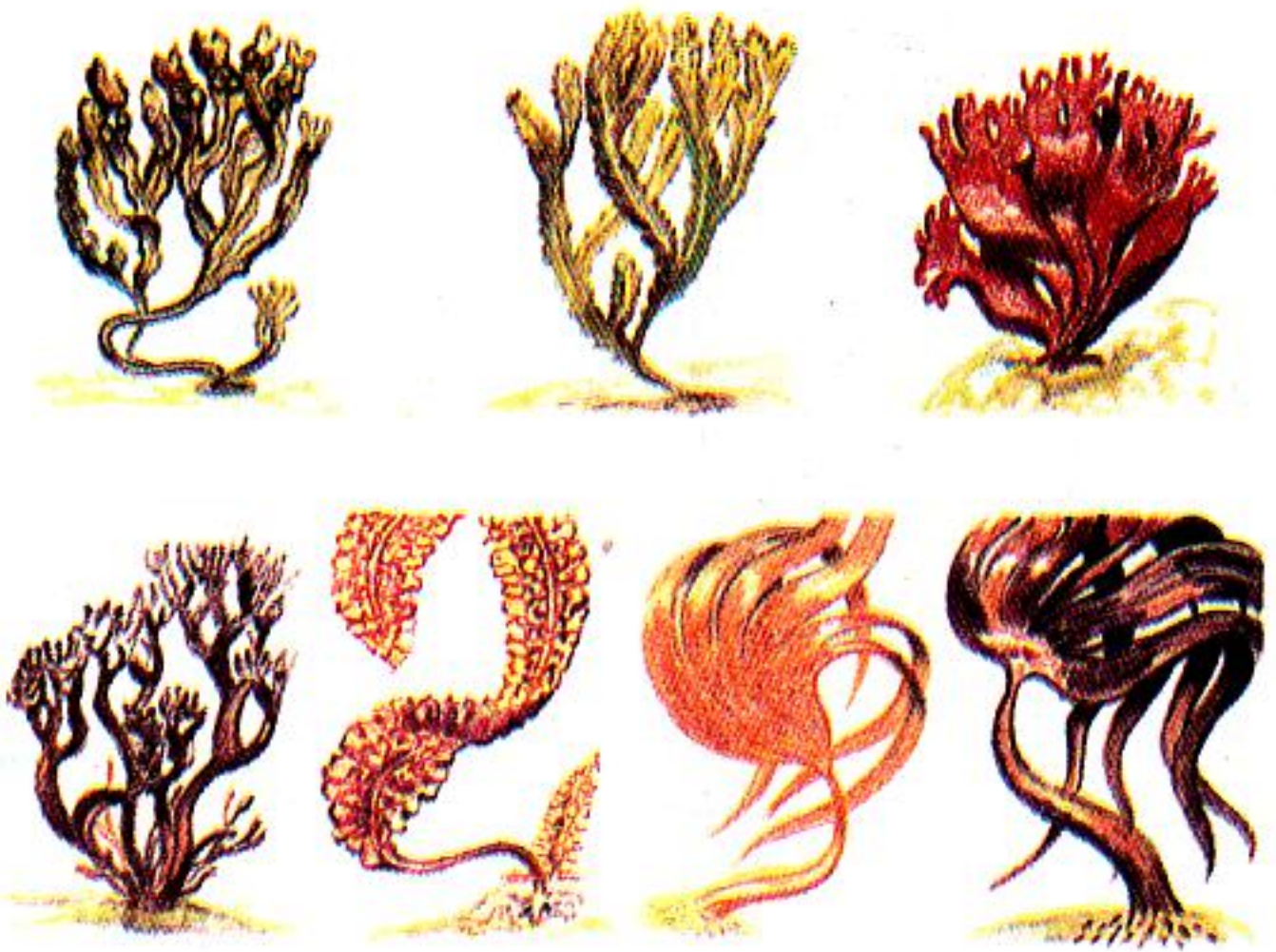
"Diatoms can only be seen through a microscope as they are too tiny to be seen otherwise. There may be hundreds of diatoms in a single drop of water. They occur in many different shapes. Some link together in patterns while others float on their own. When a diatom dies, its coat falls on the sea-bed. The left-over coats from millions of these tiny plants form a huge layer or mass of silica at the bottom of the sea. And over millions of years, these layers turn into stone. This stony material is used to make tooth-pastes and scouring powder. Even dynamite can be made from the fossil layer called kieselguhr, which is capable of absorbing more than three times its own weight of an explosive called nitroglycerine."

"Algae in my toothpaste," grinned Malav. "Mummy did not tell me this," he said. Malav's mother was a dentist and he made up his mind to surprise her with this nugget of information. She would be so surprised.

Miten had recently seen a T.V. programme on seaweeds. He asked Swati, "Sea-weeds also grow in water, don't they? I mean they are 'sea'-weeds aren't they?"

"Yes," said Swati, "Sea weeds are definitely aquatic. The largest of algae are seaweeds. They grow in different shapes, sizes and colours. The stems of sea weeds may be green, blue-green, brown or some shades of pink-red-purple. These colours are derived from pigments other than chlorophyll. However, the colours work together with chlorophyll during photosynthesis. So, although the green colour of chlorophyll might be masked and not readily seen, sea-weeds do have green chlorophyll. These underwater plants prepare their own food."

"Ma'am, since algae are among the world's first life forms they are quite primitive. Is that why they are so small?," asked Shantanu.

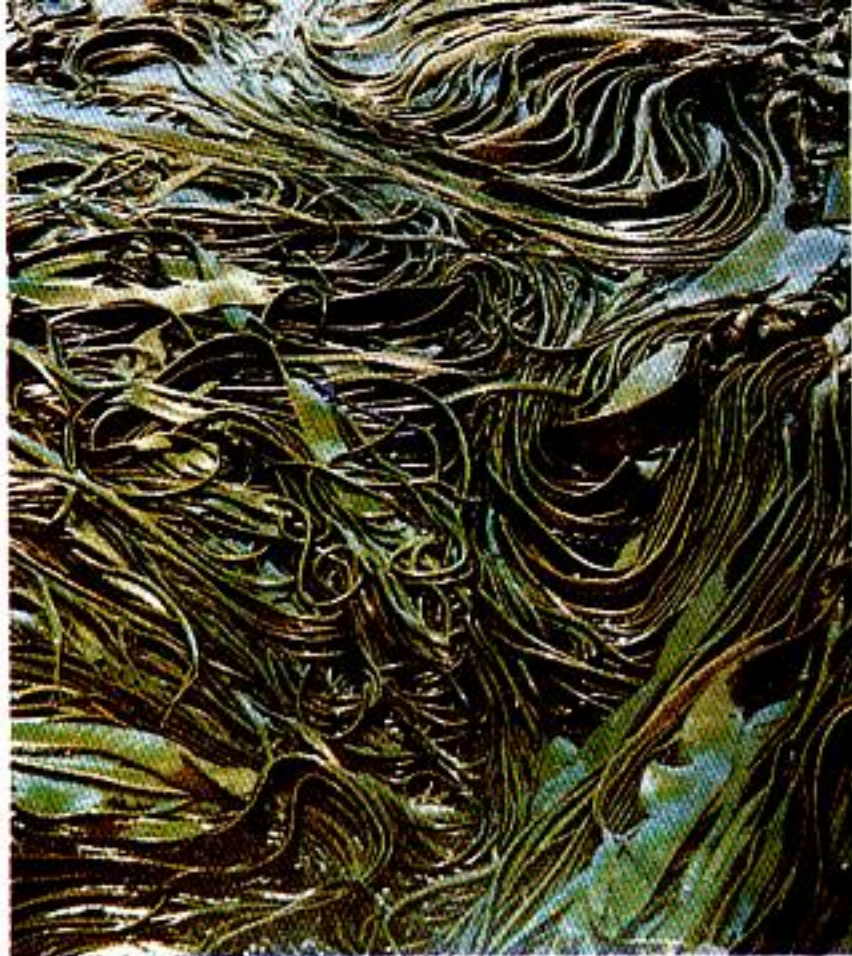


Sea weeds come in many colours

“Not all algae are tiny,” replied Swati.

“Some sea weeds can be really huge. In ancient days, sailing boats used to get stuck in floating jungles of sea weeds. The Atlantic Ocean has a huge floating mass of a seaweed called Sargassum. And the place where this seaweed grows, is called the Sargasso Sea. Even now, boats get stuck in the tangled plants.”

“Seaweeds generally cling to the rocks to keep from being swept away by the waves. Giant kelp, a brown seaweed has hundreds of branches and can be as long as 46 metres. It provides food and shelter for many aquatic animals. ‘Eel’ grass looks like a lawn of waving grass under water. Even without major strengthening tissues, the giant kelps can grow so big, because the sea water supports its weight to a large extent.” explained Swati.



Just imagine how huge
these giant kelps are

"Are these large algae of any use to us?," asked Riddhima.

"Yes. Of course," replied Swati. "Health experts say seaweeds are healthy foods. These are eaten as vegetables or in soups, for example, *wakame*, *komby*, *arame* and *dulse*. I'm sure you all love ice-creams. Well, I'm sure you didn't know some seaweeds are used in ice-creams. Algae produce agar, a form of jelly, which helps in the easy setting of an ice-cream."

"Toothpaste, jelly, ice cream, I never knew algae were so important to me," grinned Miten.

"Ma'am what about plants growing near the sea-shore. How do they survive? Are they different from plants growing on the land?," asked Riddhima.

"The seashore is not really hospitable to most plants. Yet there are some plants like Sea bells and trees such as the Mangrove which grow along the seashore. Those plants which can tolerate a lot of salt in the environment are called halophytes. They are often fully or partially submerged by sea-water when the tide comes in. Halophytes have the ability to get rid of the excess salt from shoots or old leaves and stems. Sea lavender and Marsh samphire are two examples of such plants. Of course, some flowering plants such as water-lilies and grasses such as rice, can live partially submerged under fresh



Marsh samphire

water. Being able to tolerate the high level of salt in the environs is a special ability."

"Ma'am, do you mean that plants growing in a watery environment will have an 'inside-structure' different from plants growing in non-watery environments. It seems strange. I mean, I come from dry Rajasthan. Am I different from Paarmi who comes from wet Assam? The children roared with laughter at Riddhima's question. Swati joined them.

When the laughter subsided, she said, "No, Riddhima and Paarmi are not basically different, although humans living in geographically distant lands do have distinctly unique features. Just think of birds. Don't ducks that swim have webbed feet? These features are called adaptations. They help the animal to adjust to its environment. Even plants do this. Every living being has to adjust to the surroundings or else it will not survive. Plants being the first citizens on Earth, had a variety of environments to explore. They are surprisingly versatile and often plants living in similar environs devise different



Sea lavender

means to overcome the restrictions imposed by the environment.”

“What about plants in the swamps?,” asked Malay.

Swati elaborated, “Swamps consist of mud and water – messy stuff. Many plants grow in swamps, and I’ll give you an interesting example. The strange looking special roots of the swamp cypress are known as ‘knees’. These allow oxygen to reach the plant. These roots grow upwards from the soil under water like miniature tree trunks. They are hollow in the middle for the air to flow down below the



Papyrus

water while their stems and leaves grow above. The stems of the Papyrus plant from which the world's first paper was made grows in the valley of the river Nile in Egypt."

Knees are just strange

water to the normal roots deep in the mud. The swamp cypress grows in waterlogged ground. The plants in bogs and swamps generally have their roots in



"Horsetails, another swamp plant remind you of a paint brush. It grows in swampy places around the world. This plant lives a double life. The winter and spring 'looks' of the plants are quite unlike. They almost look like two different plants."

So engrossed had the children become in strange aquatic plants that they had not realized that it was getting dark and that they had to return to the camp site.

"Hurry up, we should reach before the sun sets," reminded Ms Agarwal. Reluctantly the children wound up their chat.

The next day was the last day of the camp. The children lit their final camp fire, sang songs and danced around it, and had great fun.

The next morning everyone got up very early and packed up for the return journey. All felt sad that the camp had come to an end. But on the other hand they wanted to reach home quickly and narrate all that they had learnt, to their parents. The children thanked their teachers and got into the bus.

The teachers sat right in front, hence Miten or anyone else did not get a chance to chat with them. Vignesh was feeling better now but was quiet all through the journey. The children sat quietly, peeping out of the window or engrossed in deep thoughts. All were tired. Some of them even dozed off. The bus reached Mumbai on time. Parents were waiting to pick up their wards. The kids bade good-bye to their friends, thanked their teachers again and proceeded home.

Miten's father had come to pick him up. Miten was so excited that he kept chattering continuously about his trip all the way home. Mrs Shah was waiting eagerly for her



son. After freshening up, Miten described his adventures. He also told his parents how he had sneaked out in the dark and about Vignesh's fall. He talked to them about the strange plants he had discovered during his camp. Mr and Mrs Shah thought it was a miracle that their son had developed a liking for plants.

Next day Miten went to school. Studies went on in full swing as the children were to have their second semester examinations soon. But as everyone knows, time really flies. The examinations got over and the Diwali vacations began. That vacation, the Shah family planned to visit Sikkim and Darjeeling. Miten was excited. He drove his parents crazy with his innumerable questions. Many of the questions were about plants. Secretly Mrs Shah began to wonder if Miten's new-found interest in plants was such a good thing after all. She even mentioned it to Mr Shah and both laughed over her comment. However, Mr Shah was determined to nourish his son's interest in plants. He returned home the next day with a fat parcel under his arm. It was a lovely book, full of colour pictures of plants.

Mr Shah had brought the book for Miten to read on the journey. Miten was thrilled with his gift. He put a cover on it so as not to soil it.

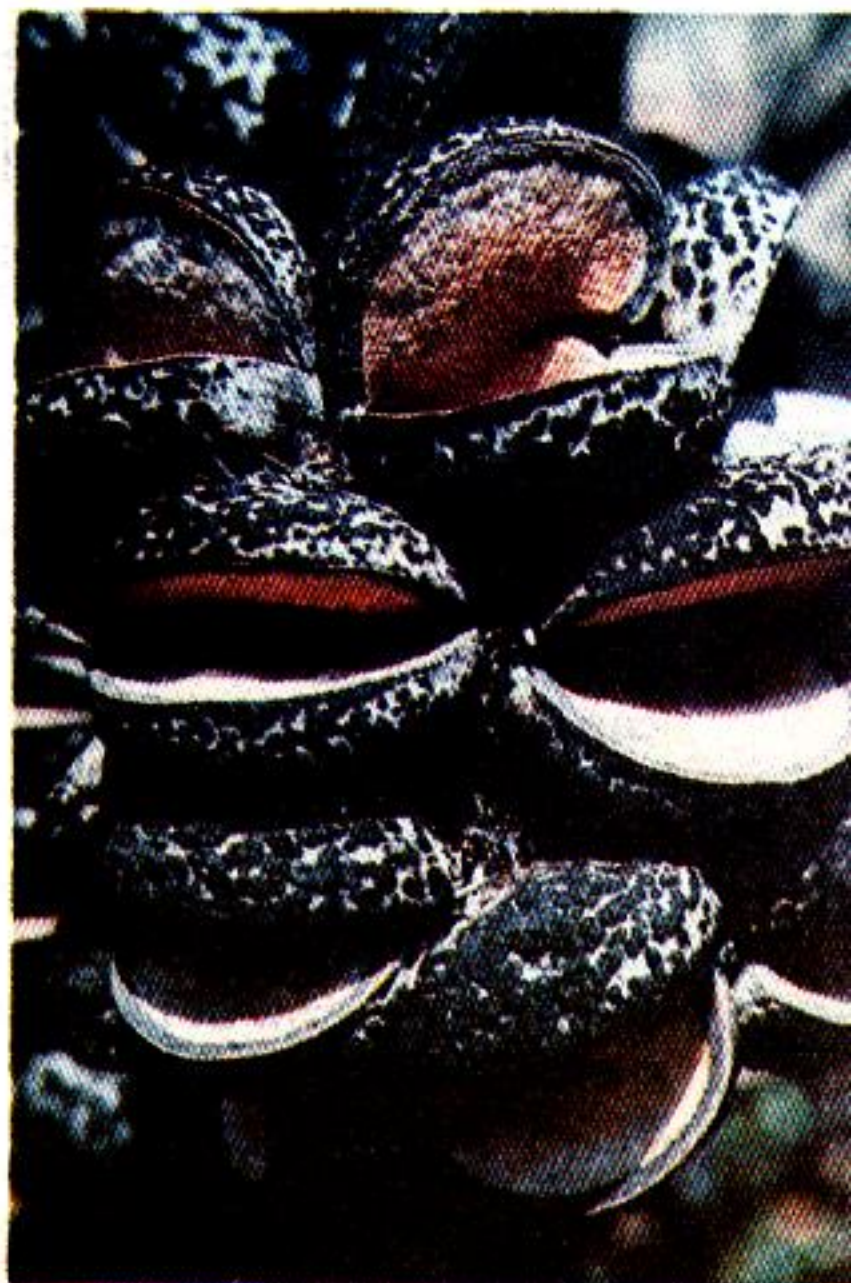
The journey to Gangtok was a very long one. All through the journey Miten buried his head in the book. Indeed plants were strange. Not only were they different but some of them were weird too. As he read through the book he became all the more intrigued.

"The baobab tree in Australia has a huge hollow trunk which was once used as jail. The best known-type of baobab trees, is found on the African mainland. It has an extremely thick, often bulging trunk. This tree may grow 18 metres tall with a trunk from 9 to 15 metres in

diameter. Many live up to 1000 years or more. The tree has white flowers that open at night and are pollinated by bats. Its fruit is called monkey bread. It is about 30 centimetres long and it dangles from tree like a lantern from a long ropy stem. A baobab's trunk contains much water-storage tissue but little wood," he read aloud. Imagine being jailed inside a tree', he thought. A smile played on his lips. His parents gave him curious looks but since he was so immersed in the book, they did not disturb him.



Closed Banksia before the fire



Open Banksia after the fire

Miten read on. "Fire is dangerous for plants but not for the Australian *Banksia*. It needs fire before its seeds can crack open and start to grow. The heat of bushfires trigger the opening of the seed pods. The ghost gum tree that grows amongst dry rocks has a ghostly white dazzling trunk. It somehow manages to find enough water from the rocky soil in which it grows."

"The *Yucca* flowers are pollinated by female *Yucca* moths which lay eggs in the flower's seed producing organs. The eggs hatch into caterpillars which feed on seeds. Stone plants of South Africa have leaves that look like the stones among which these plants grow. A white or yellow flower grows in a slit between the tops of the leaves." After reading so much, Miten fell asleep. An hour or so later, he woke up.

His mother handed him an apple.

"Feeling good?," she asked him with a smile.

"Yes, Ma. That siesta helped. Where is my book?"

"Don't tell me you are going to start reading again," said his mother.

"Oh, Ma! you don't know how strange and lively plants can be. They may seem to be mute, stationary and quite boring, but they are nothing of the kind. They are quite clever, actually. Some day, I'll tell you all about them," he said in a learned tone and picked up his book.

"A few plants actually eat insects by trapping them. Such plants grow in places with poor soil and so they eat insects to get extra food. The insects are tricked into deadly traps where their bodies are turned into a liquid which the plant soaks up. Plants need a salt called nitrate and this is generally obtained from the ground-soil. But in certain places, for instance, in swamps, there is not

much nitrate, so the plants trap and digest insects to get the nitrate and minerals they need."

"The leaves of a Pitcher plant are shaped like a vase, with slippery sides. Inside the leaf, there is a pocket filled with sweet-smelling nectar. The insects smell the nectar and are lured inside. The sides of the leaf are slippery and covered with downward-pointing hairs. The poor insect slides down into the liquid and drowns. The plant absorbs the minerals from the insect's body.

Another insect eating plant — the Sundew plant has leaves covered with tiny hairs. Each hair has a drop of sticky liquid. The sun's rays gives a sparkle to the drop and this attracts insects. As soon as the insect touches the liquid, it gets glued on. The hairs around the insect bend over slowly. They push the insect against the leaf. A juice oozes out from the leaf and digests the insect.

The *Saraseenia* plant has its leaf shaped like a bag. Insects that fall into it cannot escape.



The pitcher plant is an insect trap

The leaves of Venus fly trap are hinged and they remain open like an open oyster shell. When the insect touches the hair on the fleshy part of the leaf, the two parts snap shut and trap the insect. Enzymes or special chemicals, ooze from the leaf and break down the proteins in the insect's body. The plant then absorbs the minerals. The process may last about one week. The parts of the fly that are not eaten are blown away when the leaves open later."

My God! This is almost like hunting a prey, thought Miten, almost falling off his berth in excitement. Thank-



The venus fly trap catches insects too



No place to fly now

How could flowers grow in the face of such cold?

Gurung seemed to read his thoughts. Changing gears to suit the steep climb, Gurung spoke, "Generally, on high

fully they had reached New Jalpaiguri from where they had to take a taxi to reach Gangtok so not much harm would have been done even if he had.

The Shah family left the station. They had no difficulty in hiring a taxi that would take them to Gangtok.

"Sir, please call me Gurung," said the smiling driver to whom Miten took an instant liking.

"Gurung uncle may I sit next to you?" he asked.

"Of course, hop in," said Gurung and Miten did just that. The luggage loaded, Gurung started his jeep. "I am a good guide too," he told Miten "I know lots about the plants and animals that are found high up in the hills and of course, all about the places you will visit."

Soon, they left Jalpaiguri far behind. Miten was glad he had his jacket on. He looked out. The road was lined with pretty wild flowers. The flowers seemed to be spread like a carpet in the distance. He was fascinated.

mountains such as the Himalayas, the tops are covered with ice and snow. The weather is unpredictable. A little lower down the mountainside, the plants bloom, as the snow melts in summer. The alpine lily that grows here has a slender stem that can bend in the wind and hence does not get damaged even during storms. So we mountain people say that if you are humble and simple and bend before the might of the Almighty, you will be able to live

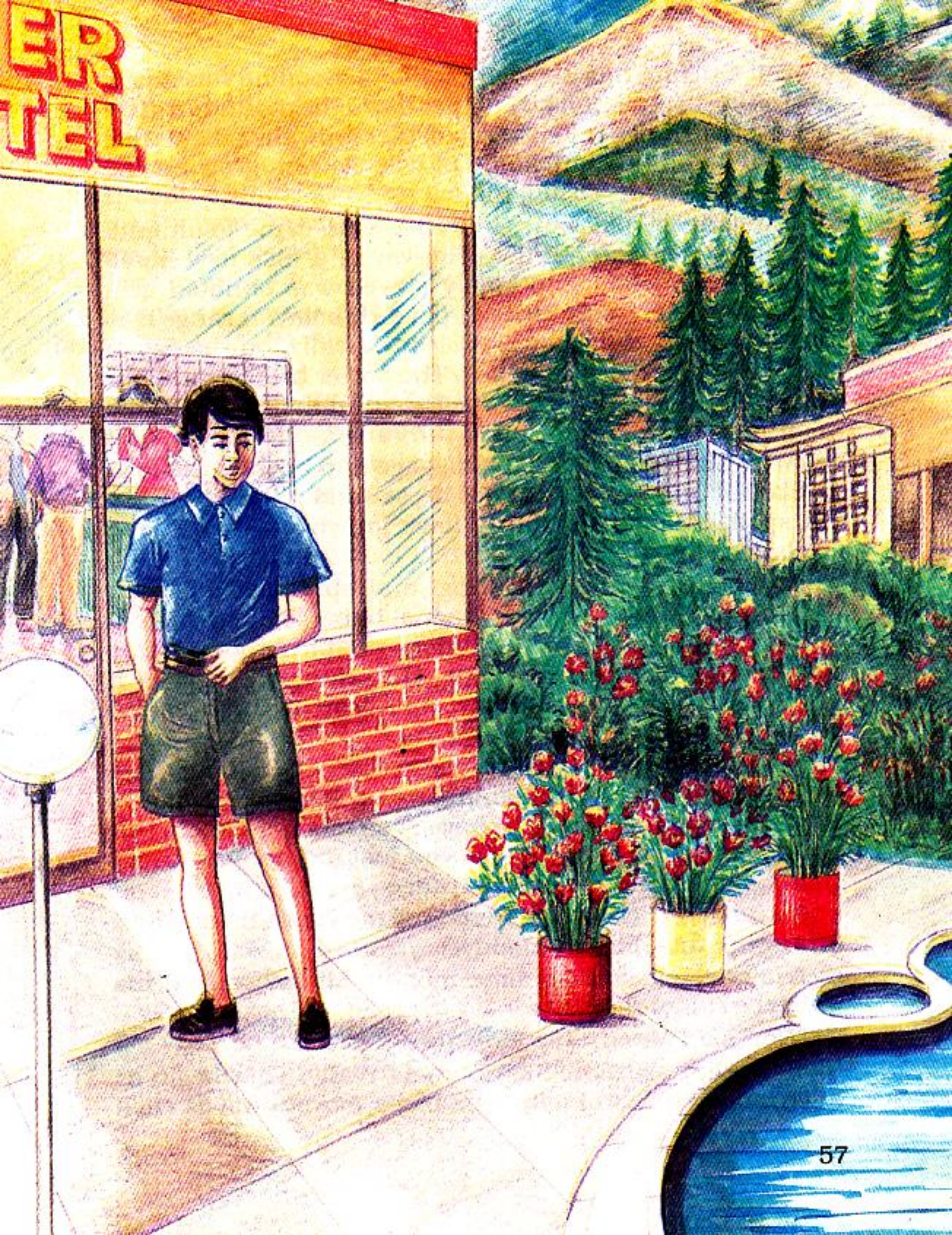


Edelweiss is the National flower of Switzerland

through the harshest of trials. Different flowers have different ways of fighting the cold. Just as you are wearing a wool-lined jacket, Edelweiss, the tiny white flowers have a special thick layer of hair which acts as a woollen coat."

"Edelweiss! As in the song in the Sound of Music?" asked Miten excitedly.

"Yes, son," replied his father seeing Gurung's rather lost look.



But Gurung was not silent for long. Soon he was giving a running commentary. "Further down the mountain grow trees, small and bent and still further grow the taller trees. Hundreds of different kinds of wild flowers grow on the mountain slopes of Gangtok."

The journey pleasant as it was, soon came to an end. Gurung's jeep entered the driveway of a nice new hotel. The hotel in which the family stayed was situated at a height from where the snowcapped Himalayan range was visible, provided the sky was clear. Luckily, on the day of their arrival, there was no fog. The porter brought in their luggage and showed Miten the beautiful Kanchenjunga, a mountain peak in the Himalayan range.

Mrs. Shah unpacked the luggage and opened the food packets, "Oh my God! Look at these sandwiches, they are all spoilt. Mould and fungi have grown on them," she exclaimed.

Miten heard the word fungi and sprang to his feet. "Mummy let me see." He had a close look and said, "Fungus is a plant and yet, it does not have roots, stems nor does it have green colour. But Mummy, what is a mould, is it also a fungus? How did it grow on this bread?," asked Miten curiously.

Mrs Shah was busy cleaning up the food-bag. She was too upset to reply. Mr Shah answered instead, "A mould is also a fungus. You might have seen moulds growing on stale bread earlier too. Maybe you just did not pay attention. Some moulds are very strange..."

"Strange!" exclaimed Miten. "Tell me about them. I love strange plants. Please, Daddy."

"Have you heard of slime moulds Miten?" asked his father.

"No," said Miten.

"Well they are more like 'animals' really. They begin as microscopic blobs of jelly. The blobs move towards each

other and join together to form a 'slug'. The 'slug' crawls along. Then, it stops moving and becomes a long thin stem with a knob on the end. The knob dries and breaks open to expose thousands of tiny spores which are released in the air. Moulds grow on dead plants and animals. Some attack living creatures or plants causing disease. Do you know that certain moulds are actually made to grow on food to make it taste better? The moulds in Stilton and Roquefort cheese give them their special taste."

By now Mrs Shah had disposed off the spoiled bread. She washed her hands carefully and came over to where Miten was sitting. "Talking about bread and cheese is making me hungry," she said.

Mr Shah hastily dialled room service and ordered meals for three. While he was speaking into the phone, Mrs Shah quizzed her son.

"Miten tell me, what is used to bake bread?,"

"That's easy. Flour."

"What makes the flour rise?" asked his mother.

"Tell me," Miten said.

"Yeast makes the flour rise. Yeast is also a fungus. There are about 100,000 of different kinds of fungi. Yeast looks like round drops of jelly. The plants are very tiny and you can see them under a microscope. They float in the air. When flour is mixed with water making a warm and wet paste in which sugar is added, the yeasts feed on the sugar. The yeast plant swells up and a new bud is formed on it. Each new bud grows and separates from the parent. A part of the sugar that these plants eat is converted into carbon-dioxide. This causes bubbles inside the dough and makes it swell. Long ago, people just let the dough sit in a warm place for the yeast plants to get into it. Today, we get yeast in packets for bread or cake-making."

A knock sounded at the door and there stood the waiter, with their food. Steaming hot mushrooms cooked with

peas, pureed spinach with cottage cheese, a rich tomato gravy with chunks of soya in it. It was a feast and the Shahs consumed it all.

"That was tasty," said Miten spooning up the last of the rice. "Now I'm sleepy," he said.

"A little rest would be in order," said his father, "but then remember we have come here to do some sightseeing, not sleep."

A small siesta later the Shahs dressed to leave.

Smiling Gurung was ready to take them around. "Gangtok has many places worth visiting. These places include monasteries and gardens. I will take you there," he said.

The family spent the whole day sightseeing. They returned late in the evening, extremely tired but happy. As they got down from the jeep Gurung spoke up. "Sir, there is a flower show at the Main Hall tomorrow. We have one every year. It is a lovely sight. Would you like to visit it?"

Miten was keen to see the show because he had read that in the hilly and cool regions grew exotic, colourful, wild flowers that would not grow in the plains. That night Miten did not sleep well. The unfamiliar hotel room, extreme tiredness coupled with excitement made him toss and turn.

However, he woke up with his enthusiasm undimmed. He tip-toed out of the room and headed for the lawns. It was a beautiful sight. Flowers in vibrant colours greeted him. A haze lay in the distance and the colourful flower-carpet on the hills was hidden from sight. But the lawn more than made up for it. He returned to his room, refreshed.

His parents were having tea. They poured him a cup to take the chill away.

Gurung arrived on time and drove them to the heart of the town where the Main Hall was. It was early, so there were not too many visitors which was a good thing. There were flowers all over the place. It was a riot of colour. Even the air seemed to be perfumed. 'Heaven must be like this', thought Miten. The flowers had name-tags. It gave the common name as well as the scientific name. Two men waited to explain and answer queries.

"Miten, if you have any questions, ask the volunteers," said Mr Shah. He was fascinated by the exotic blooms and wanted to photograph the flowers at a close range.

Miten approached one of the men and struck up a conversation. "Uncle, these orchids look so pretty. Do they grow here?"

"No, not all of them. They are cultivated as greenhouse flowers. Of course, they also grow wild. Wild orchids grow in all parts of the world except Antarctica. It's too cold there. Orchids love rain, hence they grow where there is plenty of rainfall. Orchids can grow on rocks and branches of trees. Although they grow on plants, they are not parasites. Orchids contain chlorophyll and so make their own food," explained the volunteer.

Miten looked around. The sheer variety of shapes and colours of orchid blooms caught his attention.

"Uncle," he said, "Orchid flowers look so unusual. They are pretty no doubt, but there is something strange about the prettiness."

"The volunteer laughed appreciatively. Then he told Miten a lot about orchids. He talked about the star orchid which appears like a star, the boat orchid that looks like a boat, the scorpion orchid that looks just like a scorpion and the moth orchid that resembles a moth. He told Miten about a group of orchids called Lady's slipper orchids. He even told him about the bee orchid that looks so much like a female bee that the male bees are tricked into mating

with it, in turn pollinating the flower. He told Miten that the fly orchid of southern Ecuador, has the shape and colouring of a female techinid fly. The male flies pollinate the orchids as they travel between flowers.

Miten was transfixed. Could plants be so cunning! His look of total amazement amused the volunteer. He took a closer look at Miten.

"What's your name, kid?" asked the man.

"Miten. Uncle, what's yours?"



Orchids have strange shapes. This one looks like a bee

"You may call me Tensing uncle. You seem to love plants. I'll tell you some interesting facts about orchids. In the hot, damp tropical forests of South America, plants such as orchids and bromeliads live on the branches of trees. They grow in tiny pockets of soil that accumulate in the branch. Their roots dangle freely and they take in moisture from the air. These are called epiphytes. And know what?"

Miten looked at Tensing questioningly.

There was a teasing look in Tensing's eyes. "Do you like vanilla ice-cream Miten?"

Miten nodded his head.

Tensing revealed, that vanilla essence which is used in ice-creams occurs naturally in these flowers.

"How do you know so much about plants," asked Miten.

"I am a native of Sikkim and Sikkim has wonderful flora. I also work in the horticulture department at the Government Institute in Gangtok. So, flowers are my business. But, let's see how much you know about flowers," said Tensing.

"Which is the biggest flower you know?"

"Lotus," answered Miten.

Tensing laughed aloud, "O.K., tell me the name of the tiniest of flowers."

"I don't know, please tell me," pleaded Miten.

"The biggest flower in the world is the *Rafflesia* flower which grows in the forests of South East Asia. It measures up to 90 centimetres across and weighs as much as 8 kg. This plant has no leaves or stems, just flowers. It has a smell like rotten meat which attracts the flies and beetles that pollinate the flower."

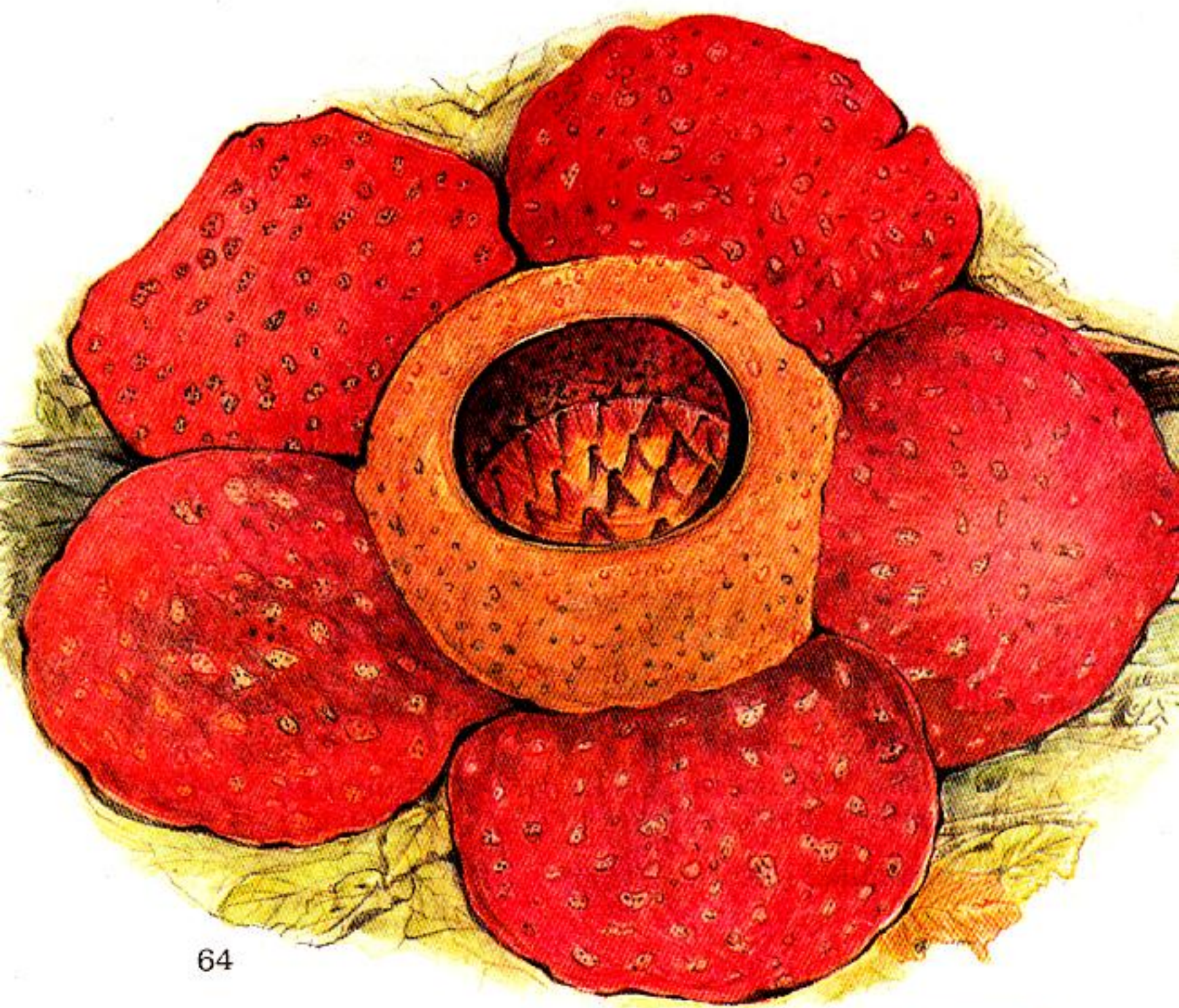
"Ugh," said Miten wrinkling his nose. "I thought flowers were fragrant. I wouldn't want to smell a *Rafflesia*."

Tensing smiled and continued.

"The smallest flower is the Brazilian duckweed. The flowers can be as small as 0.7 millimetre across." Tensing and Miten were chatting animatedly when Mrs Shah found them.

"Come on Miten, let us go, we're getting late," she said. So Miten had to leave, but not before promising Tensing to meet again.

Two days passed quickly. On the third day, Miten went to the flower show again. His father dropped him off and



promised to pick him up after an hour or so. Miten ran inside. Tensing was busy explaining something to a group of people. When he saw Miten, he signalled him to wait and as soon as he finished addressing the group, he joined Miten.

"So, how are you?"

"I'm fine Uncle. We are leaving for Darjeeling tomorrow. If you have some time, may be we could spend some time together."

"Come, let us sit outside in the garden," said Tensing. They sat under a tree. Dry brown leaves made a nice crunchy carpet for them. Miten looked up at the tree.

Tensing read his mind. He said, "You are thinking about these wonderful trees, aren't you? They are real wonders. Millions of such trees grow in hot, wet forests all over the world. They grow in India, South America, Congo in Central Africa, Malayasia and New Guinea. The moist and warm conditions provide an ideal habitat for plants to grow as tall as 46 metres high and their leafy branches link up to form a green layer as much as 10 metres thick. This layer is called a canopy. Many small plants and animals live in this canopy. The canopy shuts most of the light and the ground becomes a dark and damp habitat. This tree we are sitting under is a banyan tree. If you are going back to Mumbai via Calcutta, you may get to see another such tree. It is in Howrah and has the largest canopy."

"Well, Uncle having a wide canopy means it will have a large umbrella kind of shape. Sort of spread out. What happens if it is a tall tree? I mean, how tall can a tree really grow?"

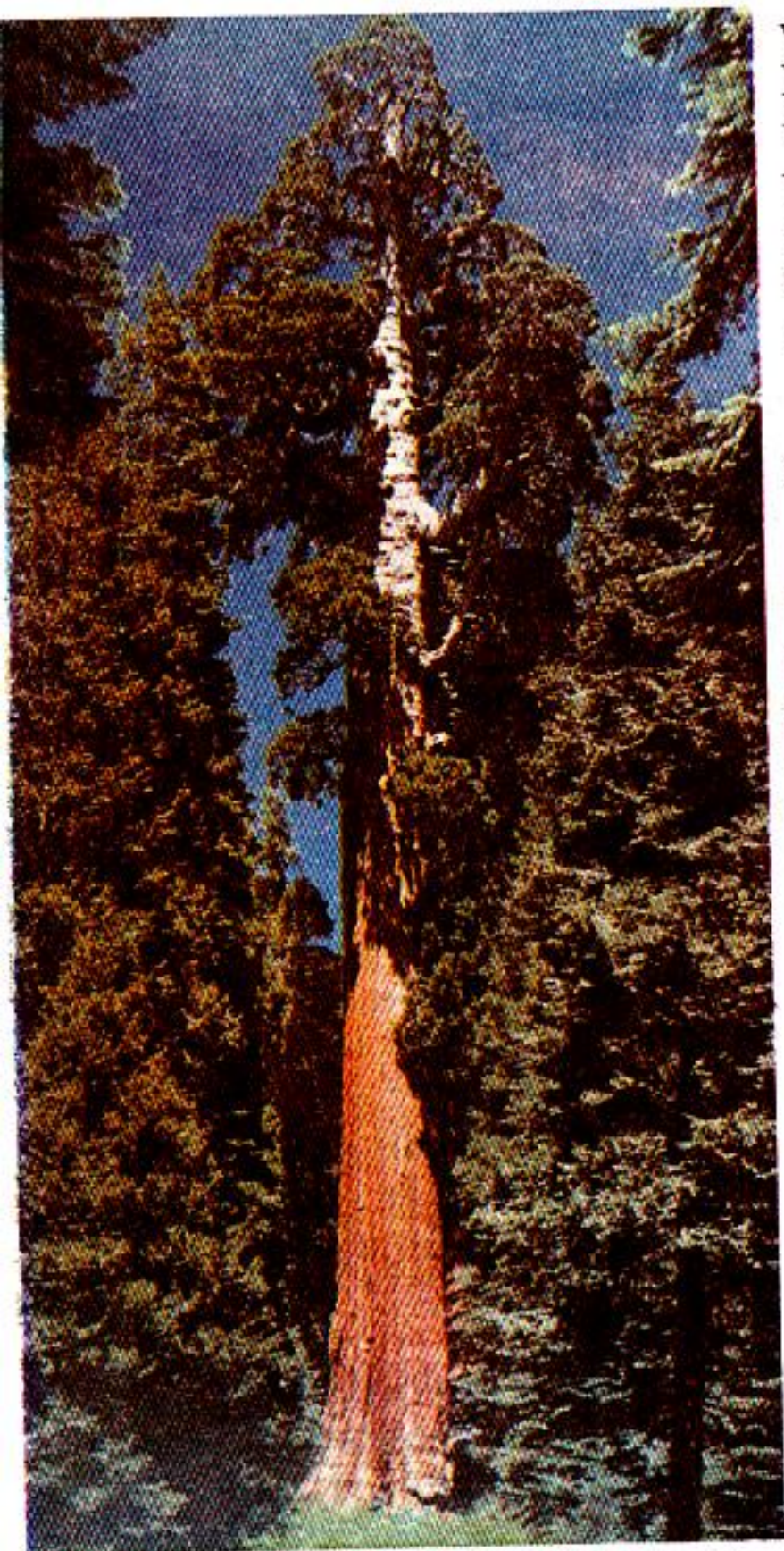
"Mm... Nice question. Let's see now, Redwoods are among the world's tallest living trees. They commonly grow about 60-85 metres high and often have trunks that

are 2.5 to 4 metres in diameter. The tallest redwood tree is in Redwood National Park in California, USA, which is 112 metres tall. Its trunk is so thick that you can hide a bus behind it! A mature redwood tree is 50 times as tall

as a fully grown person. You will be surprised to know Miten, that such tall and huge trees grow from seeds that weigh only $1/250$ th of a gram each. Now, can you tell me which is the world's largest plant?" asked Tensing.

"I don't know uncle," replied Miten.

"The world's largest plant is the giant *Sequoia* tree which is in the Sequoia National Park in America. This tree ranks as one of the oldest living thing on Earth. It is between 2,200 and 2,500 years old. The tree is named after General Sherman a famous soldier. It is just under 84 metres high and the base of its trunk has a circumference of over 30 metres. It weighs about 2000 tonnes. It has been estimated that this tree would yield over 1,400 cubic metres of timber. But of course it is a heritage no one would destroy. Another of the large giant sequoias is the



The giant sequoias reach for the skies

Grizzly Giant in the Mariposa Grove in Yosemite National Park, California, USA. The funniest thing about these red-woods and sequoia is that you can punch them without hurting your hands! The barks of these trees are very soft."

In the garden where they sat were some trees which had yellow leaves. Miten knew that leaves turned yellow in autumn especially in cold climates. He had wondered why this happened. Now he had the chance to get his answer. All he had to do was ask Tensing. He did so.

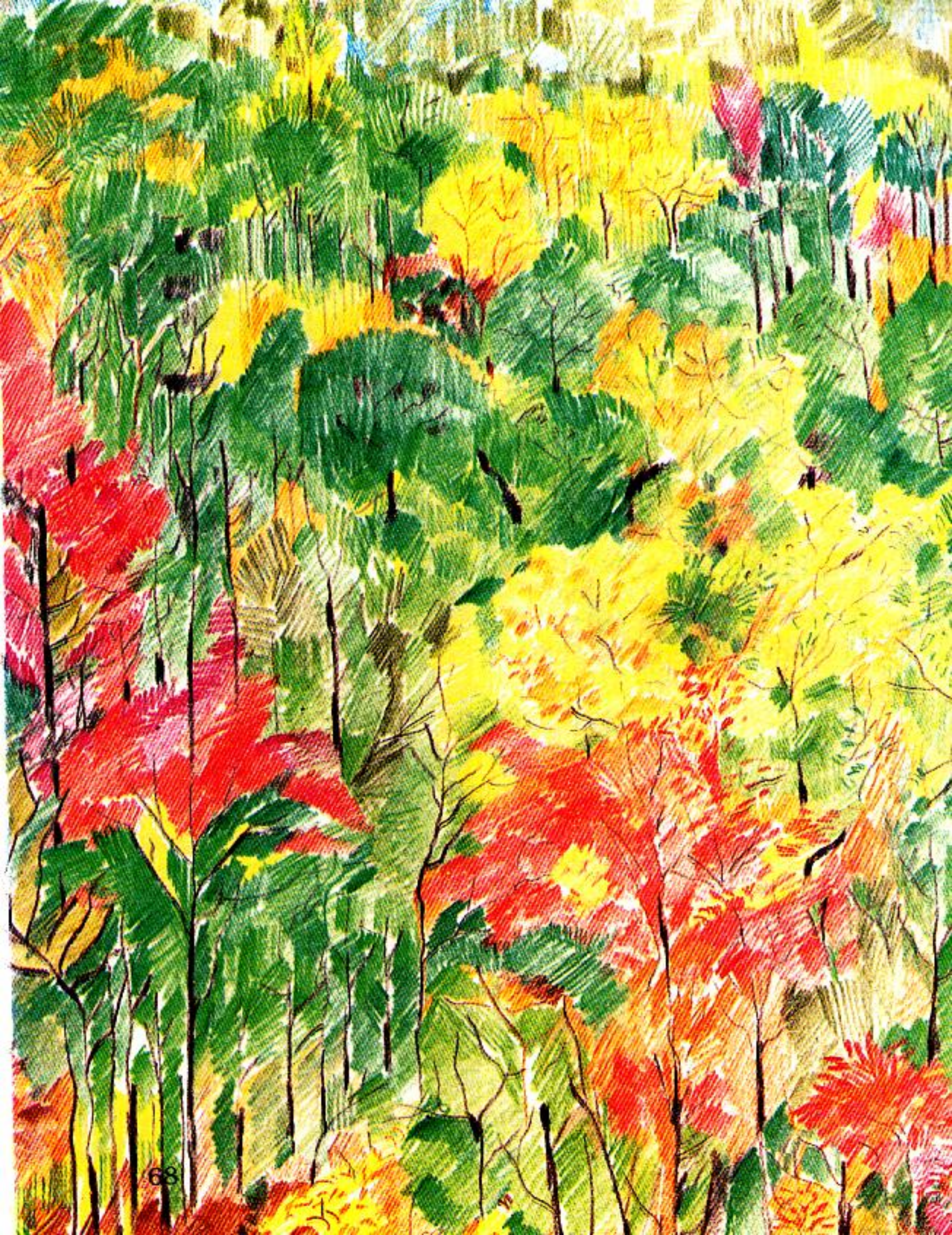
Tensing went on to explain, "You know that leaves are green in colour because they contain chlorophyll. In addition to this, they also contain a yellow-orange substance called carotene. The chlorophyll breaks down in autumn and, this makes the leaves appear yellow or orange. Under the effect of ultraviolet light, the leaves turn red. Differing amounts of these substances create a variety of colours. Leaves that have changed colour fall off the tree. Maple leaves turn bright red in winter. Those leaves which stay green even when it gets cold, are called evergreens and the plants are known as evergreen plants. These trees here will get new green leaves in another three to four months."

Miten looked at his watch. He still had half an hour.

"Miten have you heard of killer-plants?" asked Tensing

"Yes uncle, I recently read about the insectivorous plants which trap insects and digest them," boasted Miten.

"Very good. So, I'll tell you about some trees which are stranger than the insectivorous plants. They don't kill insects. They kill other trees. The Strangler fig trees in the forests of South East Asia can kill other trees. Birds eat fruits of this tree and drop the seeds on the branches of other trees. The seeds sprout and the strangler fig tree sends down long roots which creep down and twine

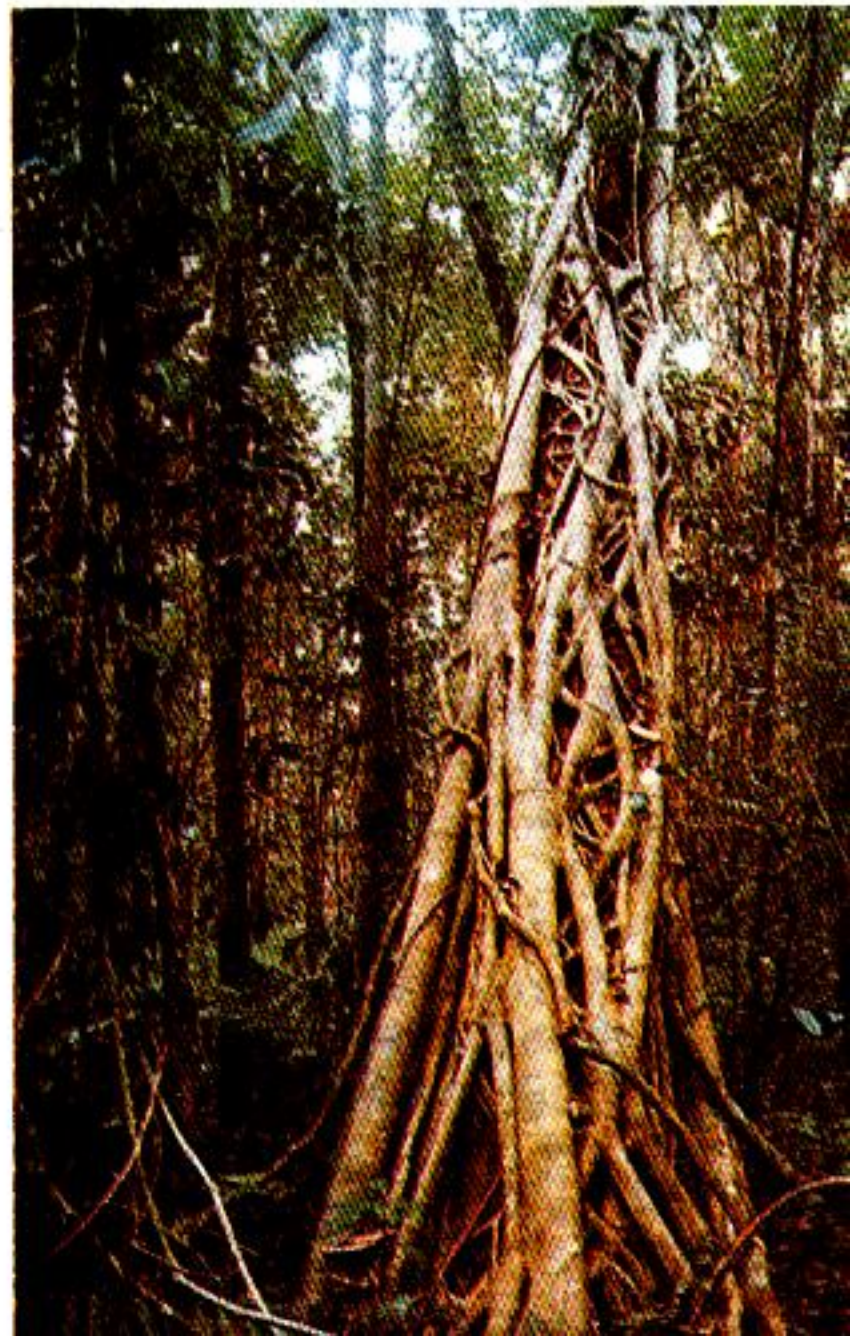




around the host plant in their search for soil. Its roots become stronger as it grows. Eventually, the host tree dies because of lack of air, light, water and minerals. The strangler fig tree strangulates the host tree."

"There are many other plants which take away water and nutrition from their hosts. Such plants are called parasites. Honeysuckle wraps itself round and round its

The strangler fig will ultimately kill its host



host as it grows. It will do so even to another honeysuckle. A dodder plant sprouts from a seed in the normal way. Then, the young seedling searches around for another plant and twines itself around its stem. It buries thread-like roots into the other plant's stem and starts to suck minerals and water out – exactly like a vampire sucking blood. When it is firmly settled on its host plant, its own roots wither away. The dodder spends the rest of its life twined around its host. The broomrape plant spreads its roots through the ground and entwines them around the roots of neighbouring plants and sucks water and minerals out. The Christmas mistletoe plant is also a parasite but it just takes water out of the host”.

Miten sat hypnotised. His mind was soaking up the information. He was not even aware when his father came to collect him. Mr Shah thanked Tensing. Then the Shahs said goodbye and left.

Early next day, the family drove to Darjeeling. Dense fog surrounded the place and a cold wind blew hard. On the way there were many tea gardens on the mountain slopes. Mr Shah explained to Miten how the tea-leaves were plucked, dried and processed to make tea. They also tasted the beverage at a road-side stall. Darjeeling had fewer places where the family went sightseeing. The family relaxed in the hotel on the day they reached. There was a slight drizzle which made the air really chilly. The next day Miten enjoyed his visit to the zoo, the highlight of which was the red Panda. The next place to visit was the Himalayan Mountaineering Institute where people came to learn about mountaineering. The institute also had a museum which was informative.

On the third day, they visited a plant nursery. Here the plants were grown in an enclosure which protected the plants from the direct rays of the sun. On the outside wall

was hung a board on which some information was printed in small typed letters. Miten stopped to read it.

"Plants grow for different lengths of time, some for less than one year, some every year or two years or much longer. Annuals such as gladioli and marigold die each year. These grow from seeds and corms in the spring, they flower in summer and make new seeds or corms. At the end of the year, the plant dies, leaving the seeds in the ground to grow back in the spring. Then, there are plants which grow and store food in the first year. In the second year, they flower and die. These are called biennials. All vegetables grow this way. Other plants sleep during winter and lie dormant until spring. They lose their leaves and look dead but each spring they come to life again. These are plants which keep growing year after year. These are called perennials. Tulips and lillies are perennials which grow from bulbs under the ground."

Miten observed closely each plant on display and read the labels carefully. There was a row of cacti, some of them with flowers. He remembered what Swati had said about the cacti stems which stored water. Their science teacher had also taught them about cacti which grew in dry regions and deserts where there is little water. He also recollected what she had explained in the class, "There are two kinds of habitats where there is a shortage of water. These are the dry places and the cold places. In cold places the water is frozen and not available to the plants. In dry regions grow cacti. There are about 2000 species of cacti. Some even grow in Alaska and near Antarctica. The saguaro or giant cactus may reach a height of 18 metres and a diameter of 0.6 metres. It looks like a bare tree but in spring, flowers bloom on the tips of the branches and stem. Cacti vary widely in shape and size."

The children had asked about the cold-deserts such as the tundra region. "This region has plenty of water but it is so cold out there, that for nine months every year, the water is frozen into snow and ice. During the remaining months, the snow melts in places and there are pools of water. The plants which grow in such cold conditions grow for a short period each year. This period coincides with the period when water becomes freely available. Some of these do not flower until they are at least 10 years old. A dwarf willow in the tundra region grows so slowly, that its stem, no thicker than a pencil may be 100 years old." The words came back to Miten so vividly that he could have sworn he was still in class.

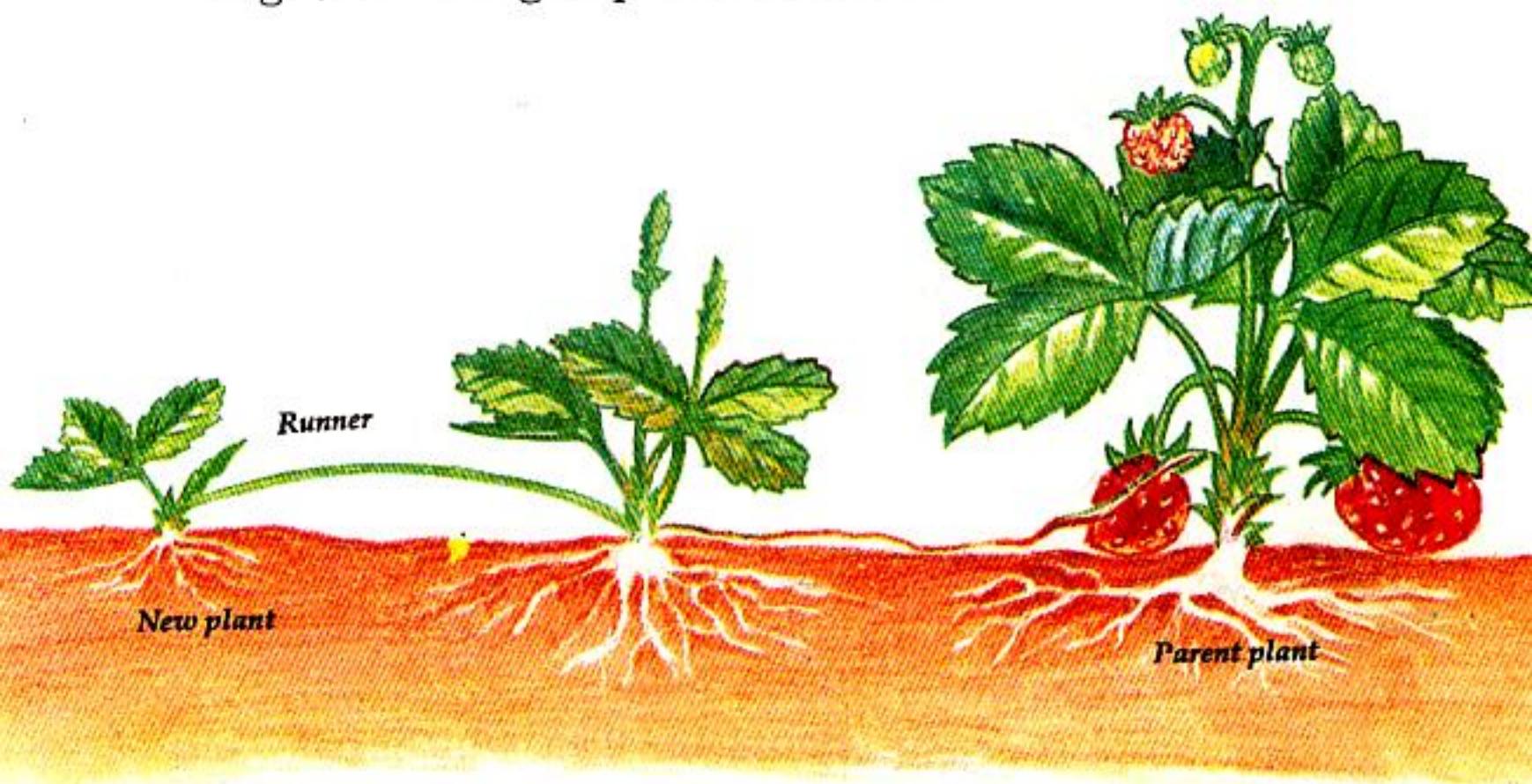
As Miten was strolling in the nursery, there entered a group of students with their teacher. They seemed to be local senior school students. Miten went close to the group



The touch-me-not (Mimosa) has sensitive leaves

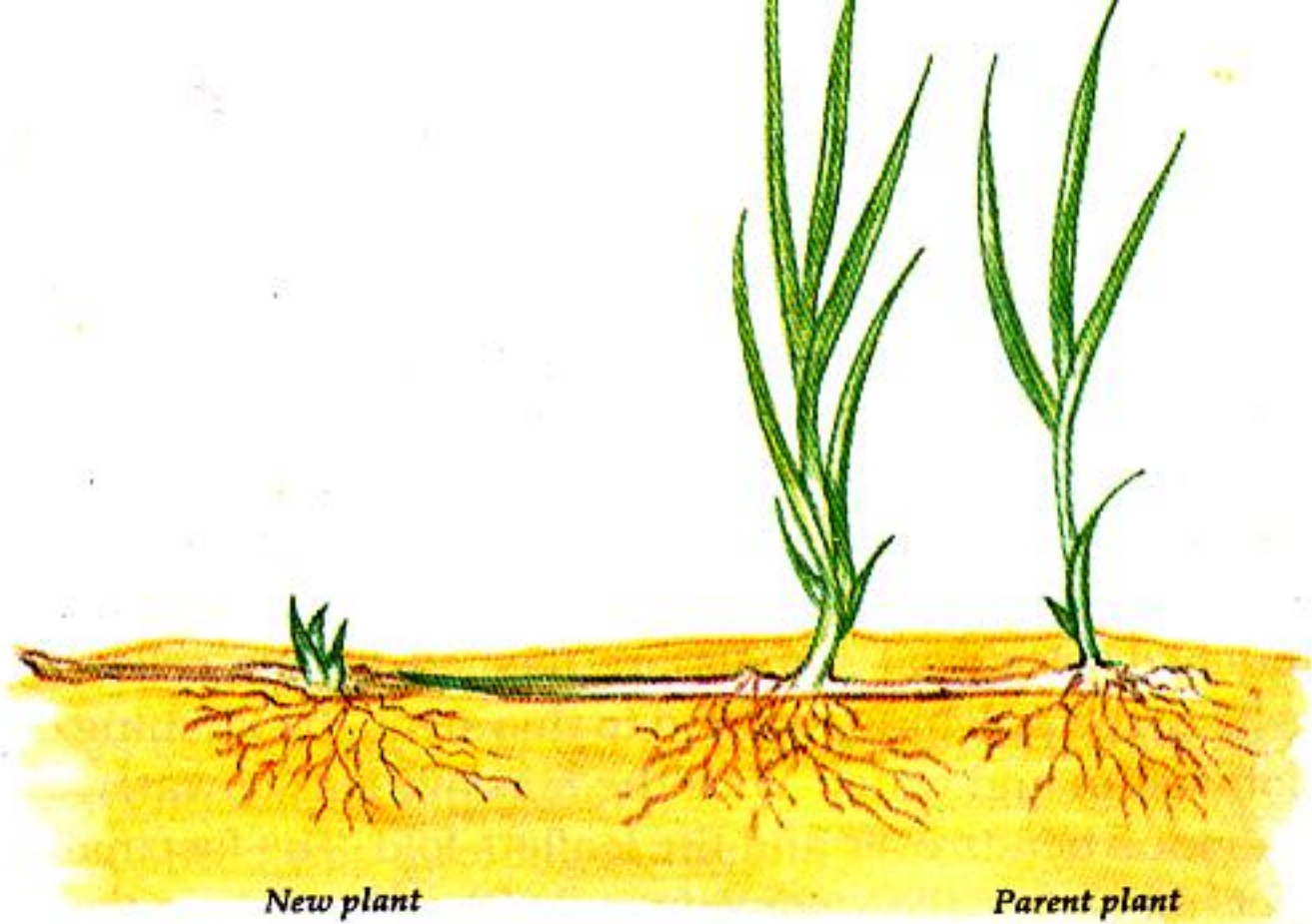
and he strained his ears to listen to what the teacher was saying.

The group walked a few paces and then stopped. The teacher pointed to some mauve flowers and said, "These are, mimosa flowers. The leaves of the mimosa plant are so sensitive that they drop when touched and perk up again after about thirty minutes. The swollen base of the leaf stalk is called pulvinus. When the mimosa plant is touched, electrical signals are flashed by the cells. The cells in the pulvinus respond to this signal by flushing out potassium and water. With the massive loss of water, the pulvinus bends over and the leaflets fold. The fascinating fact about it is that, some muscle-like fibres may also be involved in the process. If this new evidence is true, these would be the closest thing to muscles as seen in the animal kingdom." The group walked ahead.



Strawberries produce runners

Marram grass



Miten joined his parents. "Miten did you see all the plants?," asked his father.

"Yes, dad."

"Did you see the leaves of Poinsettias? They are colourful and petal-like. They are called bracts. The tiny flowers are surrounded by these leaves which help in pollination because their bright colours attract insects. Such plants are used for decorative purposes. Haven't you seen poinsettias as christmas decoration? Another such plant is Bougainvillea which has colourful leaves and tiny flowers."

"Daddy, we have Bounganville at our house entrance. They are climbers, aren't they?"

"Yes," replied his father who went on to ask him something totally unexpected. "Miten have you heard of plants producing babies? They don't produce seeds to make a new plant. Your favourite strawberries come from plants which produces runners or stems that grow across the soil surface. New plants grow on runners and put down roots to take in water and nutrients from the soil. Look closely at the potato, you'll see small buds called eyes that grow into new plants. If you plant a potato in spring and dig it up after a few months, there will be lots of potatoes growing off the old plant. Mint and couch grass grow from underground stems. Marram grass grows new plants from a net work of long stems that spread side-ways under-

ground. *Bryophyllum*, the good-luck plant has strange leaves. Tiny new plants grow on the edges of its leaves. The new plant drops down to the ground and start growing."

"A new plant can also grow from a broken piece of another plant," explained Mrs Shah.

"Yes, Shantanu told us about it," said Miten.

"I told you about Marram grass. Did you know this grass grows on sand dunes? Grasses too are interesting plants. They grow where there is little rain-fall and they grow in wide open places."

"Daddy, we have learnt about grasslands in our class,



It may not look it but the bamboo is a type of grass

In central Asia, the grasslands are called steppes, in North America, they are named prairies, in South America, there are the pampas and in Africa, it is the savanna. Grasses have growing regions above each joint of the stem. If the top is eaten, it will grow again. We eat grasses. We call them cereals though. Rice, wheat, maize, jowar, bajra are all grasses."

"Very true, Miten, but do you know about a grass which we use for building purposes?"

"Daddy," Miten's tone was reproachful. "Don't fool me. Grasses may be used as thatch but definitely not for building. They are so soft and small. Do you think you can fool me so easily!"

His father roared with laughter. Then he thumped Miten on his back and said, "Bamboo is a member of the grass family. All trees have a formative layer called cambium that enables them to grow thicker with time, but grasses do not have this layer. So, when bamboo has grown to a certain width, it stops growing sideways and grows only vertically. The space between the joints of the shoots gets longer as the bamboo grows taller. This makes the inside of the bamboo plant hollow. Shoots grow very fast. Bamboo normally reproduces by sending up new shoots from an underground runner. New bamboo shoots also grow from seeds. But when the bamboo flowers bloom, the poor bamboo plant dies."

Mrs Shah continued the conversation, "Your favourite sweets and chocolates, even peppermint, are all plants products. Without plants you won't be eating your breakfast with bread, cereals, or even be enjoying snacks such as cakes and popcorn. The nuts that go in ice creams, sweets, fudges and '*chikkis*' are all seeds. Peanuts grow underground on small leafy plants. Coconuts grow on tall palm trees. You also must have learnt about plants that give us clothes to wear. The cotton we wear, comes from



the seeds of the cotton plant. When the plant flowers, the seed pods become ripe 'bolls'. They look like round fluffy balls. The fluff is twisted into thread and woven into cloth. Flax plants look so dainty and delicate but their tough stalks make strong linen threads. Hemp plants make coarser material used for carpets and string. Leaves of Sisal plant are used to make string and rope. Plants give us perfumes and colours or dyes too."

Mr Shah could not resist interrupting, "We can make tyres, bouncy balls and elastic bands from secretions of the rubber trees. The rubber trees are now grown in plantations. A slant cut is made in the bark of the tree. A juice called latex oozes out. This is collected and processed in a factory. Thank the rubber tree for your bicycle ride or a car ride. Even the gum you are chewing is partly a plant product. Wood too comes from trees. Paper is made from wood pulp. Without paper, we would have no books or newspapers. Bamboo, cane and certain reeds are used for building houses and furniture. The most important thing of all, is that the plants make useful medicines too."

"Well, Chotu, did mention it," said Miten with a wry smile. Then he said, "Discussing about plants sure was a great 'time-pass'. The topic is 'never-ending'. Mummy, may we take a plant home from here?"

"Yes you may, but see that it reaches properly. Remember you will have to carry it home and care for it later." said his mother.

The lady in the nursery packed a small cactus with a red flower in some moss and put it in a plastic bag. She assured Miten that it would not die provided it got 'shaded' sunlight. Miten was prepared to carry the cactus all the way home. The trip was over and the family was on their way back. By now Miten had learnt many things about

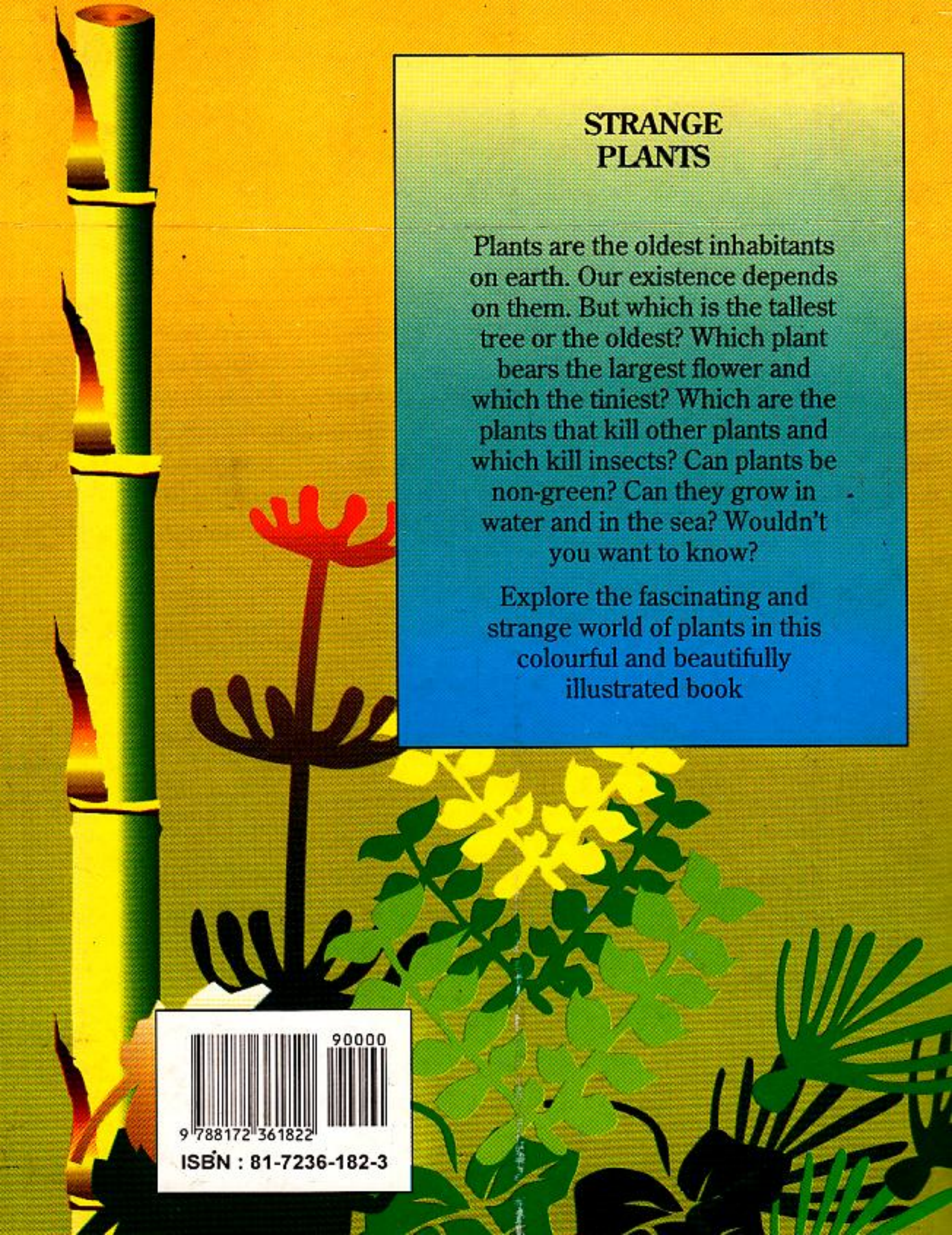
plants. He was eager to reach home and go back to school and tell his friends everything about his trip. He had decided to include plant collection as one of his hobbies from now on.



“Why not have a scrapbook Miten, where you can enter the names, both common and Latin, as well as add one or two lines about where the plant grows and to what uses we put it,” suggested his mother.

“You can even have a collection of pressed dried flowers and twigs,” added his father.

Really, the options were endless thought Miten, now not even irritated that the train was two hours behind schedule. The first thing Miten did, on reaching home, was to plant his cactus in a pot and to water it. Then he ran to his neighbour's house and brought 'his' potted plants back one by one. He vowed he would never be lazy when asked to water them. Plants, were not boring, they were an interesting lot.



STRANGE PLANTS

Plants are the oldest inhabitants on earth. Our existence depends on them. But which is the tallest tree or the oldest? Which plant bears the largest flower and which the tiniest? Which are the plants that kill other plants and which kill insects? Can plants be non-green? Can they grow in water and in the sea? Wouldn't you want to know?

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